

SPACE BASED SENSORS TO DETECT GRAVITATIONAL WAVES

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Abstract: Gravitational waves are travelling from billions of light years and by travelling their energy go on decreasing that's why the gravitational wave detector receives signal of very low intensity. Gravitational Waves also play an important role in deep study of universe. As the intensity of gravitational waves received on the earth is 1 part in 10^{20} which is very less therefore this paper provides an idea to launch space based sensors for intelligent detection of gravitational waves with more accuracy without any noise and disturbance in signals as compared to the disturbances occurred in the detectors present on earth.

Keywords: carbon nanotubes, nanotechnology, sensors

I. Introduction

Gravitational waves are generated when accelerated masses and propagated as waves in fabric of space time at a speed of light. Henry Poincare first proposed gravitational waves in 1905 and. Gravitational waves are originated when two neutron stars or two black holes merges. There are many detectors present on earth to detect gravitational waves such as LIGO (laser interferometer gravitational observatory), VIRGO, and European Gravitational Observatory. They were first observed on 11 February 2016 by LIGO collaboration and the second gravitational waves were observed on 26 December 2015. The Laser Interferometer Space Antenna (LISA) is the space based detector to be launched in 2034. The research on this observatory is ongoing under ESA (European space agency) and also in other countries on large scale.

When gravitational waves were first observed on earth was of very small intensity which has strains of less than 1 part in 10^{20} . There are many sensitive detectors present on earth which can detect gravitational waves of range of about one part in 5×10^{22} . The detectors present on earth are detecting gravitational with very low intensity which is not enough to get to know more information about them. So basically we need space based sensors to sense gravitational waves and then they will send signals to the ground based detectors and alert them to increase their range of detection to detect gravitational waves more accurately.

II. Objective

This research mainly focuses on the enhancement in detection of gravitational waves with more intensity as compared to receive on the earth. Basically this paper promotes space based sensors for gravitational waves. These sensors will sense the gravitational waves and make the ground and space based detectors alert. These sensors will be fabricated from carbon nanotubes due to their phenomenal physical, optical, electrical, chemical properties and a lot more applications.

III. Problem statement

The detectors present on earth receive the signals apart from gravitational waves which can cause noise. As the intensity of gravitational waves received on the earth is very less as compared to their intensity present in space. Gravitational waves will help us to gather more information about the universe so indirectly it reduces the chance to get that information about universe.

IV. Gravitational wave sensors

The gravitational waves are of very low frequency when they are received on earth. A sensor is the device that detect, sense or record information about the changes occurring in our environment and sends that information to the computer process attached to it. We are surrounded by sensors like cell phones, thermometer and power lift and escalators. The sensors have many innumerable applications as it helps in many fields like manufacturing, aerospace, and robotics and in daily facets of life. We can use its applications in cosmology also. The sensors are fabricated on microscopic scale using MEMS (Micro electro mechanical systems) technology. This technology is of microscopic devices which are with moving parts. This is combination of Nano-scale into nanoelectromechanical systems (NEMS) and nanotechnology. These devices are consisting of segments of very small size and their range lies between 0.02 to 1.0 mm. MEMS technology have many applications like accelerometers, MEMS gyroscopic, Interferometric modulator display (IMOD) and optical switching. MEMS gyroscopic are used in remote controlled and automatically sensing. By using this technology, we can launch sensors made from carbon nanotubes in space to detect gravitational waves and send data to the attached computer systems.

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VI. Conclusion

The detection of gravitational waves using present detectors is the only source to detect them. So basically sensors made from carbon nanotubes by using MEMS technology will be of compact in size which will easy to launch in the space. They detect gravitational waves more rapidly and raise the ability to know more about mysteries of universe. So, these sensors will help in better detection of gravitational waves.

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