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The Laser Interferometer Space Antenna (LISA) will be a large-scale space mission designed to detect one of the most elusive phenomena in physics and astronomy, gravitational waves. With LISA we will be able to observe the entire universe directly with gravitational waves, learning about the formation of structure and galaxies, stellar evolution, the early universe, and the structure and nature of spacetime itself.

The era of gravitational wave astronomy has begun with the direct detections of gravitational waves from merging binary systems containing black holes and neutron stars by LIGO and Virgo. On Earth, observations are limited to objects with masses a few 10's of solar masses, which produce detectable signals in the 10 Hz to 1 kHz band. Larger mass sources, for example from the mergers of massive black holes at the centers of galaxies, will produce signals at much lower frequencies. These low frequency signals will be undetectable on Earth due to numerous noise limitations, seismic noise being one.

The European Space Agency (ESA) leads the mission, and consequently numerous European countries are contributing. NASA (USA) is a major collaborator, as well contributions from JAXA (Japan). The LISA Consortium consists of scientists from around the world. LISA will be the first space-based gravitational wave observatory. LISA will consist of three identical spacecraft in a triangular formation separated by 2.5 million km, following Earth in its solar orbit. Launch is planned for 2034.

LISA will be observing the gravitational wave universe in the frequency band from below 10^{-4} Hz to above 10^{-1} Hz. The observations will be made through the use of six active laser links between three spacecraft. These will be continuously operating heterodyne laser interferometers with pm/Hz$^{1/2}$ sensitivity. The light for each link will be from well-stabilized lasers at 1064 nm delivering a power of 2 W. However, only ~ 100 pW of power will be detected after the 2.5 Mkm propagation.

The relative arm-length measurements will be conducted via laser interferometry between freely floating test masses inside drag-free spacecraft. The test masses and the associated gravitational reference sensors are essentially identical to those recently flown on the successful LISA Pathfinder Mission. The test masses will follow their geodesic trajectories with sub femto-g/Hz$^{1/2}$ spurious acceleration. Two test masses will be in free-fall inside each spacecraft, with each one serving as a geodesic reference end mirror for a single arm of an interferometer. Each spacecraft must follow the two test masses along each of the two defined interferometry axes; this is based on local interferometric position measurements. The test masses will be electrostatically suspended to the spacecraft along the other degrees of freedom; the control will be implemented by a combination of interferometric and capacitive position readouts.

This talk will summarize the LISA Mission, with a special emphasis on the laser, optical and interferometeric systems. Sources of noise that will limit the measurements will be discussed. Also described will be the current state of the LISA Mission, and the activity plans up to the expected 2034 launch.