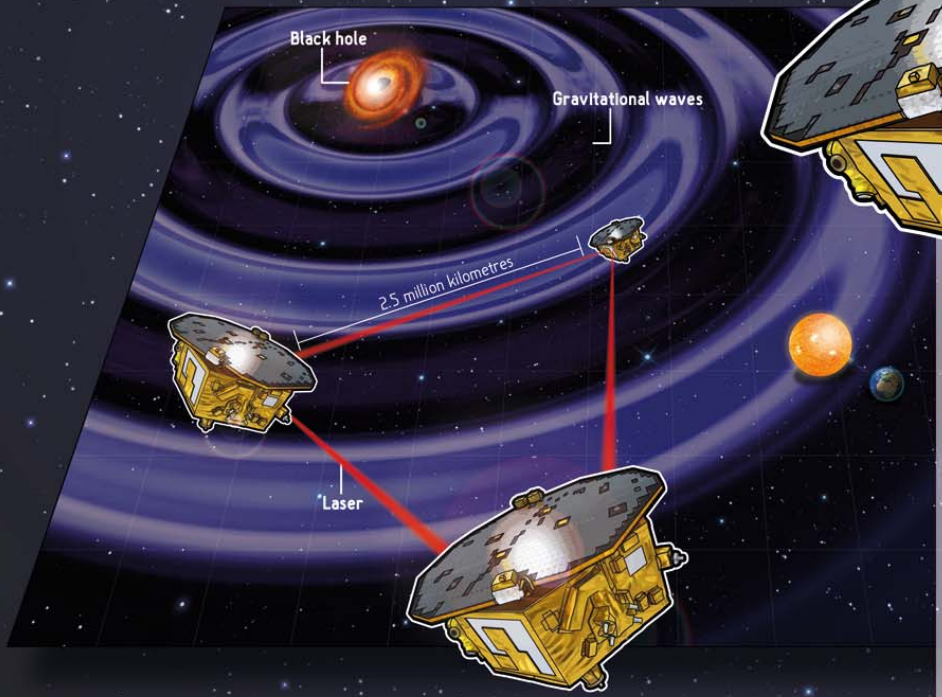
LISA

Taking the search for gravitational waves into space

Due for launch in the mid-2030s, LISA (Laser Interferometer Space Antenna) will be the first dedicated space-based gravitational wave detector. LISA will consist of a constellation of three identical spacecraft arranged to form a triangle with 'arms' one million kilometres long.



LISA will work rather like LIGO, which made the first historic detection of gravitational waves, but, with arms 600,000 times longer than LIGO, it will extend our capabilities to 'listen' to new kinds of dark phenomena in the Universe.

The distance between the spacecraft is precisely monitored so that even the tiniest changes in the lengths of the 'arms' caused by a passing gravitational wave can be measured.

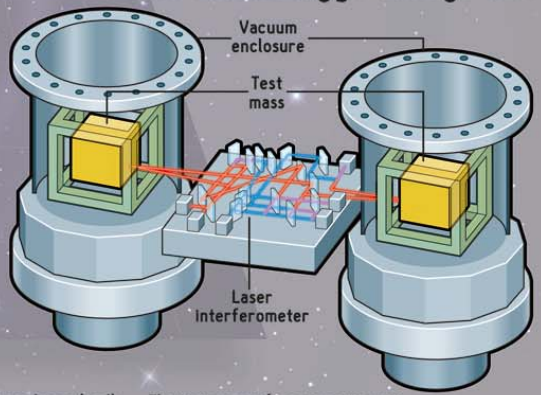
LISA Pathfinder

Launched in 2015, LISA Pathfinder paves the way for the LISA mission by testing the concept of a space-based gravitational wave detector in miniature.

It serves as a test bed for the technology by mimicking one arm of the future LISA constellation.

LISA Technology Package (LTP) onboard LISA Pathfinder is a miniature version of one arm of LISA. Instead of three full-size spacecraft separated by one million kilometres, it has two test masses – identical 46mm cubes – separated by around 40 centimetres. They are housed in individual vacuum enclosures.

LISA Technology Package (LTP)



A laser beam (red) probes the test mass positions and is recombined with a reference beam (blue) to detect any movement.

The test masses' movements must only be influenced by gravity so they have to be protected from other forces – such as the pressure of sunlight, magnetic fields, temperature fluctuations and the LISA spacecraft's own gravity.

So far, LISA Pathfinder has exceeded performance expectations by a factor of five.