

Video: Testing gravity—inside LISA Pathfinder

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ESA's LISA Pathfinder mission is a technology demonstrator that will pave the way for future spaceborne gravitational-wave observatories. It will operate about 1.5 million km from Earth towards the Sun, orbiting the first Sun–Earth 'Lagrangian point', L1.

The animation of the spacecraft build-up begins with two freely falling test masses. Between them lies the central component of LISA Pathfinder's payload: the 20 x 20 cm optical bench interferometer. A set of 22 mirrors and beam-splitters directs laser beams across the bench. There are two beams: one reflects off the two free-falling test masses while the other is confined to the bench. By comparing the length of the different paths covered by the beams, it is possible to monitor changes accurately in distance and orientation between the two test masses.

A box surrounds the two masses without touching them, shielding them from outside influence and constantly applying tiny adjustments to its position. This internal payload is housed in a central cylinder, isolating the test masses from the other components of the science payload and spacecraft.

The solar array provides power to the instrumentation and acts as a thermal shield. Microthrusters control the spacecraft to keep the master test mass centred in its housing, opposing the force of the solar radiation pressure – the main source of 'noise' – impinging on the [solar array](#).

Although LISA Pathfinder is not aimed at the detection of gravitational

waves themselves, it will prove the innovative technologies needed to do so. It will demonstrate that the two independent masses can be monitored as they free-fall through space, reducing external and internal disturbances to the point where the relative test mass positions would be more stable than the expected change caused by a passing gravitational wave, equal to much less than the size of an atom.

Provided by European Space Agency

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