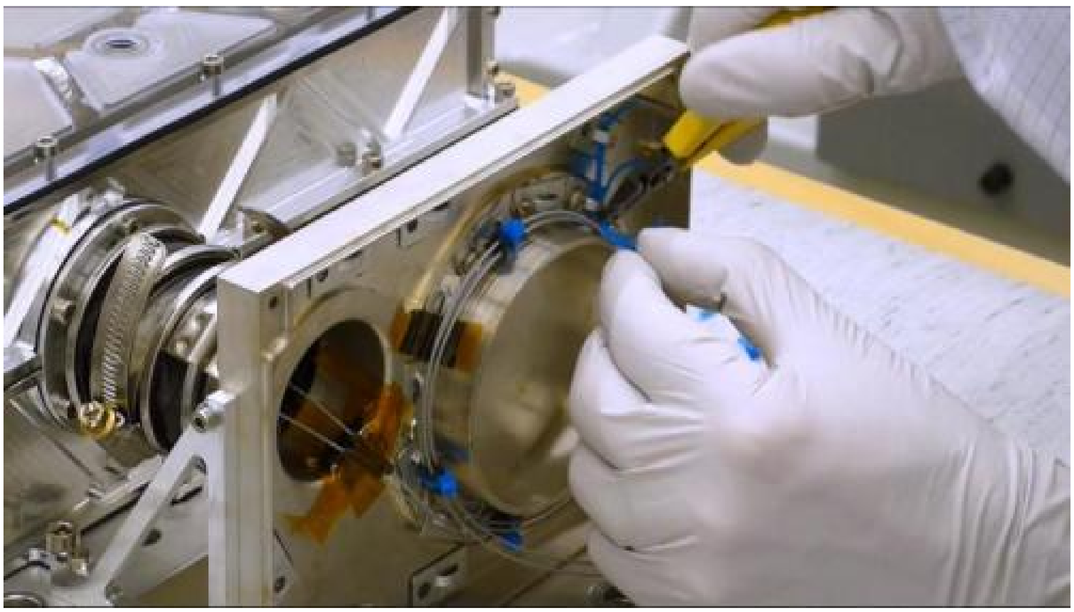
LISA Pathfinder: From CAD models to ready-to-fly hardware

September 2 2013



LISA Pathfinder space mission reached another important milestone: Its heart, the optical bench, was now further integrated into the core assembly of the satellite. Dr Christian Killow (Scottish Universities Physics Alliance Advanced Fellow) said, "It is rewarding to see CAD models turning into real hardware!"

The optical bench was built and tested at the Institute for Gravitational Research (IGR) in Glasgow. Since its delivery from IGR to Astrium

Germany it was tested again and then integrated into the LISA Technology Package – the satellite´s core that will prove key technologies for the eLISA mission.

"Getting LISA Pathfinder's core measurement technologies ready to go operational means that we have just completed another crucial step. We are now firmly on course for a launch in 2015", says Prof. Karsten Danzmann, director at the Max Planck Institute for Gravitational Physics and head of the Institute for Gravitational Physics at the Leibniz Universität Hannover.

Now a lot of effort goes into the final documentation. This is a crucial part, because the ongoing integration of the optical bench will be performed by other teams. Additionally the documentation will enable the operations centre to interpret the received data during the mission, which will be launched in 2015.

LISA Pathfinder is an ESA technology test mission that aims to prove essential key technologies for future space-based gravitational-wave observatories, which cannot be tested on Earth, but only in space. For this purpose, one laser arm of a planned large gravitational wave mission, like eLISA (evolved Laser Interferometer Space Antenna), is reduced from millions of kilometres to 40 cm to fit into a single spacecraft.

Paving the way

LISA Pathfinder is paving the way for a large-scale space mission designed to detect one of the most elusive phenomena in astronomy – gravitational waves. Extreme precision is required to detect the tiny ripples in the fabric of space and time predicted by Albert Einstein. A direct detection of gravitational waves will add a new sense to our perception of the Universe: for the first time we will be able to LISTEN to the Universe because gravitational waves are similar to sound waves.

Hence gravitational wave astronomy will complement our understanding of the Universe and its evolution. Gravitational waves measured by a large mission in space will allow us to e.g. trace the formation, growth, and merger history of massive black holes. Also it will enable us to confront General Relativity with observations, and it will probe new physics and cosmology with gravitational waves.

International collaboration

LPF is an ESA led mission. It involves European space companies and research institutes from France, Germany, Italy, The Netherlands, Spain, Switzerland and UK and the US space agency NASA.

The concept and details of the optical system for LISA Pathfinder have been developed at the Max Planck Institute for Gravitational Physics (Albert Einstein Institute) in Hanover, Germany. Its director Karsten Danzmann is Co-Principal Investigator of the mission and shares the scientific leadership with Stefano Vitale, University of Trento, Italy.

The Institute for Gravitational Research (IGR) from University of Glasgow played a major role in defining the interferometer elements and the breadboard model of LISA Pathfinder. For building the flight interferometer IGR scientists developed precision alignments at a sub-micron level used to mount components onto the optical bench. IGR scientists also designed and manufactured a highly stable fibre collimator, which aligns the laser beams.

Provided by Max Planck Society

Citation: LISA Pathfinder: From CAD models to ready-to-fly hardware (2013, September 2) retrieved 25 May 2024 from https://phys.org/news/2013-09-lisa-pathfinder-cad-ready-to-fly-hardware.html