In search of dark matter – the Euclid space telescope

20 June 2012

Dark energy and dark matter are both fascinating for scientists, yet they remain a mystery. The Euclid space telescope, which is supported with funds from the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) Space Administration, will assist scientists in their search for these cosmic phenomena. The European Space Agency (ESA) gave the official go-ahead to the project yesterday, 19 June 2012, and the implementation phase will soon begin. Euclid is scheduled to launch from Europe's Spaceport in French Guiana in 2019, atop a Soyuz rocket.

Mapping the Universe with Euclid

How did the Universe originate, and what is it made of? To try to answer these questions, the European space telescope will explore the 'dark side' of the Universe. Equipped with a 1.2-metre Korsch telescope and two instruments – a visible and infrared spectrometer (VIS) and a near-infrared instrument (NISP), containing a spectrometer and photometer – Euclid will provide an unprecedented view of the Universe. The telescope will survey about half of the sky, and effectively look back in time up to 10 billion light years. Euclid's main objective is to map the 3D distribution of up to two billion galaxies and the dark matter associated with them. The data regarding structure and galactic distribution will enable researchers to draw conclusions about the Universe’s evolution and the nature of dark energy, dark matter and gravity.

Euclid's transfer phase to the target orbit around the second Sun-Earth Lagrange point, L2, 1.5 million kilometres away, will last approximately 30 days. At this point the spacecraft’s orbital period equals that of Earth's, and provides a stable view of the larger Universe. Euclid will be there for six years, streaming data to two ground stations, in the northern and southern hemispheres.

Dark energy and dark matter – the mysterious forces

At present, the normal matter observed in the Universe accounts for only five percent of its mass. The remaining mass consists of dark matter and dark energy. Both are still unexplored, yet, to this day, the structure of our Universe cannot be explained without their existence. Dark matter is invisible and can only be detected through its gravitational effect on visible matter. Its nature is not known, but researchers theorise that it takes the form of an unknown type of elementary particle that contributes to gravity through its mass but interacts weakly with normal matter. And, although, we know that dark energy has an effect on the expansion of the Universe, it is an even greater mystery than dark matter.

Mission involving scientists from across Europe

The mission, named after the Greek mathematician Euclid, is part of ESA's 'Cosmic Vision 2015-2025' programme. Partners in industry will build the telescope. A consortium of scientific institutes and laboratories from Europe and the United States will provide the instruments and software, as well as assuming scientific management of the mission.

The German partners are the Max Planck Institute for Extraterrestrial Physics (Garching, near Munich), the Max Planck Institute for Astronomy (Heidelberg), the University Observatory Munich and the Rheinische Friedrich-Wilhelms-Universität Bonn. The German contributions to the mission, supported by the DLR Space Administration, are funded to a great extent by the German Federal Ministry of Economics and Technology.

Contacts

Diana Gonzalez
Deutsches Zentrum für Luft- und Raumfahrt (DLR) - German Aerospace Center
Corporate Communications
Tel.: +49 228 447-388
Fax: +49 228 447-386
Diana.Gonzalez@dlr.de

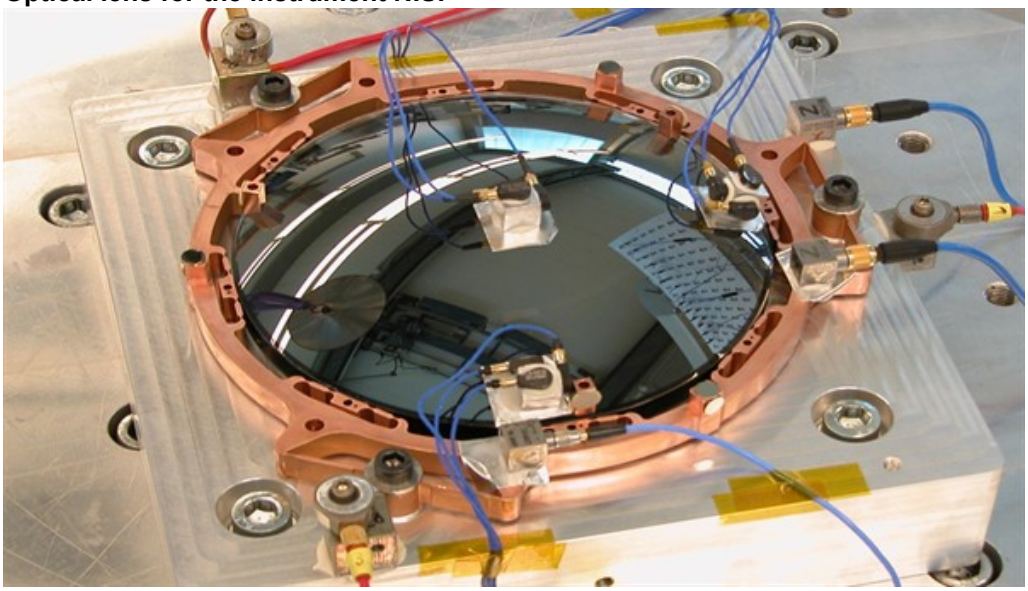
Dr Dietmar Lilienthal
German Aerospace Center (DLR)
Space Administration, Space Science
Tel.: +49 228 447-504
Fax: +49 228 447-745
dietmar.lilienthal@dlr.de

Galaxy clusters in the Universe

What holds these galaxies together, and why is the Universe expanding at an increasing rate? Euclid will try to answer these questions.

Credit: NASA, ESA, L. Bradley (JHU), R. Bouwens (UCSC), H. Ford (JHU), and G. Illingworth (UCSC).

Optical lens for the instrument NISP



The overall optical design for the near-infrared spectrometer and photometer (NISP) and the lenses of the instrument will be developed and provided by the Max Planck Institute for Extraterrestrial Physics in Garching, near Munich. Shown here is an optical lens holder during the first test.

Credit: MPE.

Contact details for image and video enquiries as well as information regarding DLR's terms of use can be found on the DLR portal imprint.