ESO / José Francisco Salgado

Radial Velocity tells us about mass

Earth based instruments use the radial velocity method to determine the mass of a planet of a solar system far away. Because of the laws of gravity, a planet orbiting around its star will slightly attract the latter, thus making the star «wobble» around. The amplitude of the star's wobble is directly proportional to the mass of the orbiting planet – the heavier the planet, the farther the movement of the central star. This movement can be measured from Earth. The world's most accurate spectrograph that is using this method is HARPS. It is mounted in the light path of a 3.6 meter telescope in La Silla, Chile and was built under the leadership of the University of Geneva. It will deliver a significant amount of low mass exoplanets as observing targets for CHEOPS.

Transit method tells us about diameter

When an exoplanet orbiting around its star «transits» between the latter and the Earth, it looks like a disk, from far away, which covers part of its star, thus making it less bright. The size of the eclipsing planet influences the amount of the decrease of light. If Earth wanders in front of the Sun, an observer far away would measure a decrease of Sunlight of about one ten-thousandth. The instrument on CHEOPS is able to measure such fine variations of the brightness. Thanks to these data, scientists can deduce the diameter of planets in distant solar systems.

Partner institutions in eleven European countries contribute to the realisation of the space mission CHEOPS under Swiss lead in collaboration with the European Space Agency ESA.

For Switzerland

Scientific institutions: CSH University of Bern, University of Geneva, Swiss Space Center EPF Lausanne, ETH Zurich.

Industrial partners: Almatech/Connova, Pfeiffer Vakuum AG, P&P Software, RUAG Space, APCO and other partners.

State Secretariat for Education, Research and Innovation SERI.

b UNIVERSITÄT BERN

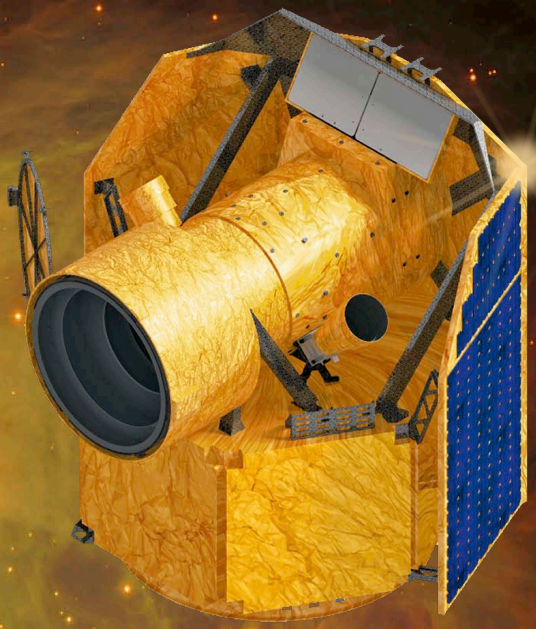
CSH CENTER FOR SPACE AND HABITABILITY

UNIVERSITÉ DE GENÈVE

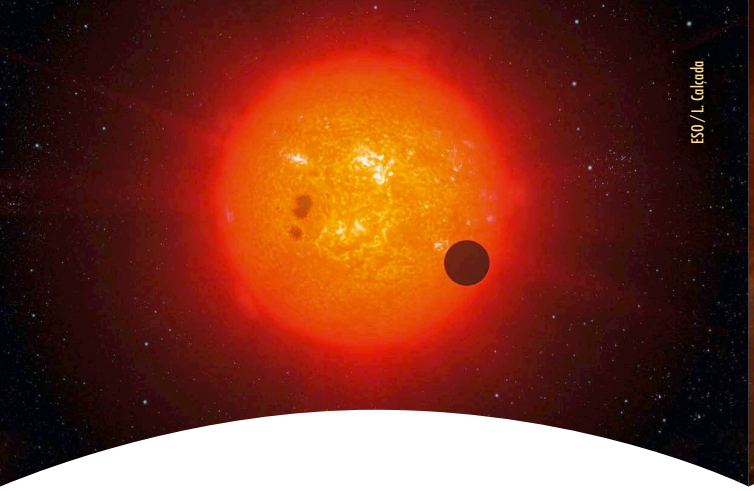
Contact:

Wei Wang
CHEOPS-Sekretariat
Sidlerstrasse 5, CH-3012 Bern
+41 (0)31 631 56 99
wei.wang@csh.unibe.ch
www.csh.unibe.ch

Further information:
www.cheops.unibe.ch

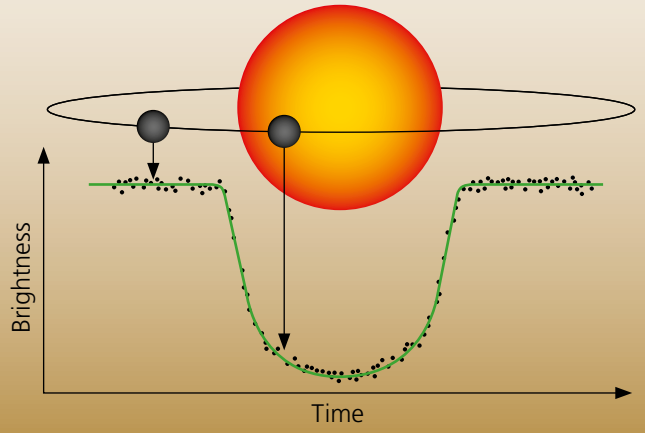


CHEOPS
CHARACTERISING EXOPLANET SATELLITE



In the footsteps of a second Earth

The discovery of the first planet, which orbits a Sun-like star far away, was made by Michel Mayor and Didier Queloz at the University of Geneva in 1995. The two Swiss astronomers detected the so-called exoplanet by measuring the radial velocity of the star (see description). It was a gas giant similar to Jupiter, but which circled its star 51 Pegasi in only 4 days. In the following two decades, researchers discovered over thousand exoplanets and more sensitive methods allowed the detection of increasingly smaller objects. Now scientists are aiming at further investigating their physical and chemical properties.



Switzerland taking the lead

This is the goal of the Swiss-led space mission CHEOPS **(CHaracterising ExOPlanet Satellite).** The launch of this 250-kilogram heavy satellite is scheduled at the end of 2017. Then CHEOPS will be shot into an Earth orbit of about 800 kilometers. Once installed, it will point its 32 centimeters wide and 1.5 meters long telescope to over 700 bright stars that are known to have exoplanets. CHEOPS will use the transit method (see infographic) to determine the exoplanets' diameters. Together with the mass of the planets, measurable by radial velocity method, the researchers will be able to derive the density of these bodies. These data will provide clues about their physical and chemical nature and will allow the distinction between gas, icy and rocky worlds.

CHEOPS is able to investigate exoplanets of various sizes including small ones with Earth-like diameters. Being able to characterise these will shed light onto the story of how planets like Earth form and evolve. The gained knowledge will be the key to future research and the most interesting exoplanets will be selected as targets for the next generation of instruments. They will be aimed at analysing the atmospheres and habitability of these distant worlds.

A network of professional partners

The main responsibility for the CHEOPS project lies with the Swiss researchers and the ESA (European Space Agency). Under the lead of Professor Willy Benz at the Center for Space and Habitability CSH of the University of Bern, further planning and the realisation of the mission will be carried out. The Swiss industry will provide the basic telescope structure, mounts and other important components, while the CSH team will integrate and test the telescope. International partners across Europe will provide additional parts. The satellite platform is built in Spain and the Swiss company RUAG Space will perform tests on the fully integrated satellite in Switzerland. The search for exoplanets in the habitable zone of a star, where Life as we know it could be sustained, has evolved into a major topic in astronomy. CHEOPS will help determine whether a solar system like ours, with at least one habitable planet, is something very rare or quite common in the Universe.