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DLR extends its research in the field of optical communications from space

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Relay station for optical free-space communication

Station for optical free-space communication including control and measuring computers

Oberpfaffenhofen - The German Aerospace Center (DLR) has successfully extended its experiments in the field of free-space communications from space. Scientists from the DLR Institute for Communications and Navigation in Oberpfaffenhofen succeeded, during the KIODO project, in 'capturing' the laser beam of a Japanese satellite 'Kirari'. Data rates of 50 Mb/sec were received.

The aim of this successful experiment was also to measure the optical communications channel between satellite and ground station, and to investigate any interference by the atmosphere of the transmission. For future tests, the scientists assume that data rates may be extended to the gigabit area.

Telescope and atmospheric measuring instruments

The so-called "Optical Downlink Experiment" that will be carried out eight times at night during June 2006 in Oberpfaffenhofen is based on a cooperation between the Japan Aerospace Exploration Agency (JAXA) and DLR. JAXA makes its satellite 'Kirari' available, and DLR its transportable station for optical free-space communications, which was already used very successfully during previous tests under the EU project 'Capanina'. In this project, in Kiruna, northern Sweden, data were received via a laser beam from an optical transmission terminal carried by a stratospheric balloon to an altitude of 22 km.

The Japanese satellite 'Kirari' from which the DLR research scientists have received data in a similar way to the KIODO project, is flying over Earth at an altitude of approximately 600 km. Over a distance of up to about 2000 km, data transmission to the ground functioned perfectly.

The ground station's protective dome

With this successful experiment, the KIODO project partners have furnished proof that optical free-space communications can be used for transmissions from space to simple optical ground stations. Additional tests with the German Earth observation satellite TerraSAR-X are also planned in the future, which will comprise a high-data rate optical communications terminal.

In the longer term, DLR research scientists consider optical free-space communications to be a necessary complement to radio transmission technology. Transmission via laser beam allows data rates which can surpass microwave systems by 100 times and thus allows completely new applications in Earth observation. Use of lasers, however, depends on the weather - negligible cloud cover is a prerequisite for any successful data transfer. This problem can be solved through a network of several optical ground stations deployed over larger distances where it is possible for the stations to alternate with each other for reception. In addition, communications could be relayed reliably by satellite links using aircraft flying above the cloud cover.

The DLR Team in front of the ground station

Related Contacts
Dr.-Ing. Dirk Giggenbach
German Aerospace Center
Institute of Communications and Navigation, Satellite Networks
Tel: +49 8153 28-2821
Fax: +49 8153 28-2844
E-Mail: Dirk.Giggenbach@dlr.de
