

## A LASER MESSAGE FROM SPACE

Anyone who remembers dialup internet can sympathize with the plight of NASA mission controllers. Waiting for images to arrive from deep space, slowly downloading line by line, can be a little like the World Wide Web of the 1990s. Patience is required.

A laser experiment on the International Space Station (ISS) could change all that. On June 5th, 2014, the ISS passed over the Table Mountain Observatory in Wrightwood, California, and beamed an HD video to researchers waiting below. **Unlike normal data transmissions, which are encoded in radio waves, this one came to Earth on a beam of light.**

The bright spot in this telescopic image of the ISS is the OPALS laser beam transmitting HD video to Earth.

Better known as "OPALS," the experimental laser device was launched to the space station onboard a Space-X Dragon spacecraft in the spring of 2014. Its goal is to explore the possibility of high-bandwidth space communications using light instead of radio waves. If successful, researchers say OPALS would be like an upgrade from dial-up to DSL, achieving data rates up to 1,000 times higher than current space communications.

The entire transmission on June 5th lasted 148 seconds and achieved a maximum data rate of 50 megabits per second. It took OPALS 3.5 seconds to transmit a single copy of the video message, which would have taken more than 10 minutes using traditional downlink methods. The message was sent multiple times during the transmission. **The video is an homage to the first output of any standard computer program: 'Hello, World.'**

Because the space station whips around Earth at 17,500 mph, "laser-tagging" a telescope on the fast-moving ground below can be tricky. To accomplish the precision tag-up, a laser at the ground station illuminated the station. **OPALS responded by sending its own 2.5 watt encoded laser signal right back in the same direction, carrying the HD video.** During the 148-second transmission, OPALS maintained pointing to the ground station within 0.01 degrees while tracking at speeds up to 1 degree per second.

NASA missions collect an enormous amount of data out in space, Laser communications is a faster alternative for getting those data to the ground.

This demonstration is paving the way for the future of communications to and from space.

