Optical Satellite Communication

Definition

The European Space Agency (ESA) has programmes underway to place Satellites carrying optical terminals in GEO orbit within the next decade. The first is the ARTEMIS technology demonstration satellite which carries both microwave and SILEX (Semiconductor Laser Intro satellite Link Experiment) optical interorbit communications terminal. SILEX employs direct detection and GaAIAs diode laser technology; the optical antenna is a 25cm diameter reflecting telescope.

The SILEX GEO terminal is capable of receiving data modulated on to an incoming laser beam at a bit rate of 50 Mbps and is equipped with a high power beacon for initial link acquisition together with a low divergence (and unmodulated) beam which is tracked by the communicating partner. ARTEMIS will be followed by the operational European data relay system (EDRS) which is planned to have data relay Satellites (DRS). These will also carry SILEX optical data relay terminals.

Once these elements of Europe's space Infrastructure are in place, these will be a need for optical communications terminals on LEO satellites which are capable of transmitting data to the GEO terminals. A wide range of LEO space craft is expected to fly within the next decade including earth observation and science, manned and military reconnaissance system.

The LEO terminal is referred to as a user terminal since it enables real time transfer of LEO instrument data back to the ground to a user access to the DRS s LEO instruments generate data over a range of bit rates extending of Mbps depending upon the function of the instrument. A significant proportion have data rates falling in the region around and below 2 Mbps. and the data would normally be transmitted via an S-brand microwave IOL

ESA initiated a development programme in 1992 for LEO optical IOL terminal targeted at the segment of the user community. This is known as SMALL OPTICAL USER TERMINALS (SOUT) with features of low mass, small size and compatibility with SILEX. The programme is in two phases. Phase I was to produce a terminal flight configuration and perform detailed subsystem design and modelling. Phase 2 which started in september 1993 is to build an elegant bread board of the complete terminal.