

MERLIN – Assembly of flight hardware for satellite deployment

Fraunhofer ILT is building the Laser Optical Bench – the core element of the laser beam source – for the Franco-German climate mission MERLIN (Methane Remote Sensing LIDAR Mission). Together with the pressurized housing developed by Airbus and the cooling, supply and control units, this bench makes up the laser transmitter.

The mission aims to measure the greenhouse gas methane in the Earth's atmosphere from a satellite. The laser pulses scattered back from the Earth's surface provide information about the methane content of the atmospheric column above. Generating the laser pulses with the required properties is not the only challenge here: The compact laser system must be insensitive to strong vibration and temperature changes. Moreover, to ensure a service life of more than three years in a closed housing, outgassing materials must be avoided to prevent contamination.

Flight hardware assembly

After the Critical Design Review (CDR) was successfully completed and the optical and electrical components and assemblies were finally qualified, the Laser Optical Bench and its components are now being built. ILT is building two models: The Engineering Qualification Model (EQM) and the Flight

Model (FM). The EQM will be used to test and qualify the overall system, while the FM is intended for the launch into space. The key technology for the successful operation of a laser in space is the stability of the individual optical mounts, which Fraunhofer ILT manufactures using soldering technology. The result is a maintenance-free laser systems that neither shows any loss of performance nor requires readjustment, even after years of thermomechanical stress.

Completion of the EQM in 2024

The EQM oscillator and amplifier have been completed and meet all requirements. The final stage – the frequency converter – has already been assembled and qualified. After it has been installed and finally adjusted, the entire Laser Optical Bench will be integrated into the housing and tests carried out on the entire system. At the same time, assembly of the FM system has begun.

The work is funded by the BMWK under FC 50EP1601 and is being carried out on behalf of the DLR Space Agency under subcontract to Airbus Defense and Space GmbH.

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Finished oscillator of the EQM.