



LAB DEMONSTRATOR OF A LIDAR BEAM SOURCE FOR »MERLIN«

Task

As part of the Franco-German climate mission »MERLIN«, a laser beam source is being designed to be used in a spaceborne LIDAR system for the global mapping of atmospheric methane relevant for climatic processes in the atmosphere. In parallel with the development of the corresponding compact opto-mechanical setup, the optical concept should be validated by means of a laboratory demonstrator.

Method

The beam source consists of a diode-pumped laser oscillator and INNOSLAB amplifier based on Nd:YAG and a subsequent OPO for generating laser pulses with 9 mJ pulse energy at the measuring wavelength of 1645 nm. To generate pulses at longitudinal single-mode operation, both the OPO as well as the laser oscillator are »injection seeded« and actively length controlled. The setup was built with standard laboratory components and displays the current optical design of the later flight module in terms of all relevant design variables, such as resonator, pump spot size, etc.

Result

In the oscillator, laser pulses are generated with pulse energies of 5 mJ at a pulse duration of 16 ns, which are amplified in the INNOSLAB stage to 34 mJ. These are converted in the OPO into pulses with 11 mJ at 1645 nm. The required 9 mJ can already be produced from about 28 mJ of pump energy. The pulse duration is, then, 11 ns. The optical efficiency of the oscillator is 28 percent, the INNOSLAB amplifier 22 percent and the OPO 32 percent. To date, the overall setup has successfully completed an endurance test of 500 hours. Further tests shall soon follow.

Applications

Using flexible lab setups to verify optical parameters plays an important role in the risk management for developing complex prototypes. This is especially true for laser sources that are so tightly budgeted with respect to all optical parameters, such as pulse duration, pulse energy, efficiency, beam quality, spectral width as well as mass, volume and power consumption. The laser platform used here is flexible and suitable for the generation of laser pulses in a broad parameter field.

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3 Detailed view of the MERLIN oscillator.