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MEASURING LIDT AT A WAVELENGTH OF 1645 NM

Task

Understanding the laser-induced damage threshold (LIDT) of optical components is essential for the design of efficient and reliable laser beam sources, especially when they are used in aerospace applications. A laser beam source emitting at 1645 nm is currently being developed for the Franco-German satellite mission »MERLIN« to detect methane in the earth's atmosphere. So far, however, there is still no LIDT measuring station worldwide to qualify the optical components at this wavelength.

Method

An existing structure, initially used at a test wavelength of 1064 nm to qualify the flight items of the laser altimeter for the ESA mission »BepiColombo«, is being upgraded for the new test wavelength. The new station uses a Q-switched single-frequency Nd:YAG-MOPA with two INNOSLAB amplifier stages and up to 500 mJ pulse energy at 1064 nm and 100 mJ at 1645 nm from a downstream OPO/OPA converter unit as a test laser source. The online damage detection system has been designed independent of the wavelength. The optics system has been adapted to use the additional wavelength of 1645 nm. The measurement sequence has been improved in terms of manageability and reproducibility of the results. The valid ISO regulation 21254 is used for LIDT measurements.

Results

The new measuring station allows ISO-compliant LIDT measurements at test wavelengths of 1064 nm and 1645 nm, each at a defined atmosphere. The test laser source provides pulses with 20 ns pulse duration and a repetition rate of 100 Hz with a Gaussian beam profile. The maximum test fluence at 1645 nm is 150 J/cm² at a beam diameter of 400 µm.

Applications

The measuring station is used for the qualification of optical components for the »MERLIN« mission. In addition, the test station is being upgraded to accommodate a test wavelength of 2051 nm.

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2 LIDT test setup.