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Near-field telescope for optimization of sounding distance of lidar systems

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Advantages

Reduced the minimum detection distance (150 m) while maintaining a maximum detection distance of 13 km, using a cheap solution based on a set of optical lenses.

The telescope design allows for **multiple channels to be installed on a single device, t**herefore permitting to collect data across multiple wavelengths, increasing the versatility and efficiency of the lidar system.

Easy alignment: the optical configuration is chosen so that the aperture necessary to obtain a field of view between 1 and 3 mRad is of the order of 1-2 mm, thus facilitating alignment on the optical bench.

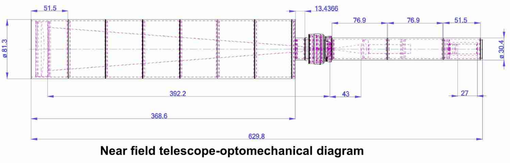
Increased optical stability: the telescope is built to maintain optical alignment even under varying operating conditions, thus ensuring consistent and highly accurate measurements.

Reduced volume and weight, leading to easy implementation in lidar systems, including airborne ones

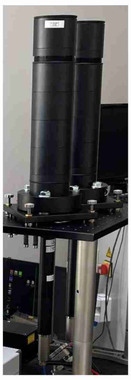
Low Implementation costs: the telescope design has been optimized to be manufactured using affordable materials and technologies, without compromising performance or durability.

Novelty

- The telescope is designed to reduce the incomplete overlap distance of tropospheric lidar systems from 800 meters to a maximum of 150 meters
- It uses the main achromatic lens (75 mm diameter x 141 mm EFL, UV-VIS coated, near-UV achromatic lens) and a secondary achromatic lens (12.5 mm diameter x 30 mm EFL, UV-VIS coated, near-UV achromatic lens).
- The angle of incidence correction is achieved with a corrector module consisting of two collecting lenses (LA4236-UV - f = 125.0 mm, Ø1" UV fused silica plano-convex lens, AR coating: 245-400 nm) and a collimating lens (LA4130-UV - f = 40.0 mm, Ø1/2" UV fused silica plano-convex lens, AR coating: 245-400 nm).
- The aperture used in the configuration has a diameter between 0.8 and 1.6 mm.
- The telescope uses an aperture with a diameter between 0.8 and 1.6 mm for a field of view of the order of 1-3 mRad.



Near field telescope-optomechanical diagram



Near field telescope-prototype

Application

- The prototype developed following this invention represents a telescope that can be coupled to aerosol detection lidar systems to optimize the probing distance, significantly reducing the incomplete overlap distance of bistatic systems.
- The use of this telescope on one or more of the channels of the lidar system allows the measurement starting at 150 m above ground of the height of the planetary boundary layer, the determination of the optical properties of locally generated particles, the monitoring of fog formation, the monitoring of particle mixing and turbulence near the surface, without compromising the quality of the signal collected from high altitudes.

Acknowledgements

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System of automatic discharge of capacitor of pump energy of laser to protect user

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Patent application no.: A00162 /2024

NOVELTY: The invention refers to a system for automatically discharging the pumping energy storage capacitor of a LASER, after the disconnection from the power supply of the high voltage (HV) block, in order to protect the user personnel, in the conditions in which they intervene on the high voltage source and make adjustments or measurements thereof. The system operates after the HV source is turned off.

The invention has the following advantages: ❶ discharges capacitors that are charged with maximum voltages of up to 4500Vcc; ❷ discharges capacitor banks with a maximum capacity of 1000μF; ❸ the maximum time for total discharge of the energy accumulated by the capacitor is less than 10s; ❹ protects the user personnel when they intervene on the high voltage source and make adjustments or measurements on it; ❺ protects the elements or devices that connect to the high voltage source, because the voltage on the capacitor, before coupling, is zero.

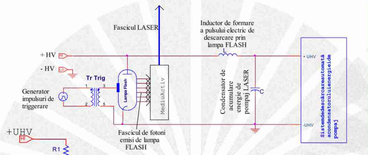

Fig. 1 - The connection block diagram of system for automatic discharge of the laser pump energy capacitor to protect users.

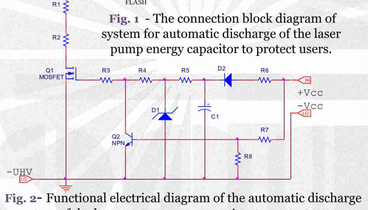

Fig. 2- Functional electrical diagram of the automatic discharge system of the laser pump energy capacitor to protect users.

DESCRIPTION: The automatic discharge system of the pump energy storage capacitor of a LASER, according to the invention, consists of a discharge element of the capacitor charged with HV voltage (4500Vcc max.) made with a MOSFET transistor (example: MOSFET transistor: IXTL2N470, which has VDSS = 4700Vcc, VGS = 20V and ID = 2A), a resistor for discharging the energy accumulated in the capacitor with the dissipated power of approximately 1/100 of the maximum power formed by the product of the maximum discharge current and the maximum voltage on the capacitor, a blocking element of the MOSFET transistor during normal operation of the capacitor and a circuit used to control the MOSFET transistor in order to discharge the pump energy storage capacitor of lasers or for any other application, consisting of: resistors, a switching diode, a Zenner diode and a capacitor.

APPLICATIONS: For high voltage (HV) sources for pumping laser energy to protect users.

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