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LiDAR technology for Climatology and Environment Sustainability

The two crucial factors that impact the society and environment are the climate change and sustainable development. The climate change has become a pressing concern currently at global, regional, and local scales as it is directly connected to the human-welfare. Investigation of the real-time climatology is the only solution to address the environment sustainability, which calls for innovative technologies to monitor the climate change periodically and precisely in both day and night times. Active remote sensing of the earth atmosphere can bridge and enhance the understanding of the surrounding environment. One such active remote sensing technology is the 'LiDAR' (Light Detection and Ranging) technology which has the ability to probe and profile the atmosphere at molecular levels. Ground-based and air-borne LiDARs have shown to provide valuable information, but their application is limited to local scales. Space-borne LiDAR is a viable technological domain to observe our planet from remote distance at global scale. Through this paper, we present details of our work related to baseline configuration and link-budget estimation for a zenith-looking dual-wavelength back-scattering LiDAR. This LiDAR employs Nd:YAG laser operating at 106 and 532 nm wavelength with pulse energies of 60 mJ and 40 mJ coupled with a 200 mm diameter telescope to collect returns from the terrestrial troposphere. This LiDAR is aimed to study the distribution and estimation of dust and aerosols accumulation in the atmosphere, which are among the prime agents for pollution triggering the climate change and affecting the human lives and environment sustainability.

Keywords: LiDAR, Nd:YAG Laser, estimation of dust, aerosols, sustainable development, climate change, Optics

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