5.4 Wavefront Reversing Mirrors for LIDAR Applications Using Optical Phase Conjugation

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Lidar instruments have been extensively investigated for many remote sensing techniques. For most applications they require powerful single frequency and frequency stable, long pulse lasers in the eye safe spectral range. Until recently only injection seeded TEA CO_2 lasers met such requirements. Unfortunately they are heavy, highly power consuming and have a short lifetime. For coherent lidar instruments for atmospheric remote sensing evident candidates are diode pumped solid-state lasers operating at eye-safe wavelengths (2μm). The lidar concept mainly consits of three basic parts: laser transmitter, trans-and receiver optics together with the scan procedure, and the coherent detection instrument. From the laser transmitter a single mode operation is expected, therefore, high reflection phase conjugate mirrors based on nonlinear optical materials are a possible solution to achieve a stable laser output. Phase aberration correction of a trans- and receiver optics can be established using nonlinear optical materials in a phase conjugating configuration and for the coherent detection the spatial overlap on a heterodyne detector can be ensured which increases the signal - to-noise ratio which limits the detectable range. In order to correct for unwanted phase aberration we are investigating phase conjugate mirrors based on stimulated Brillouin scatering that work efficiently at 2μm and in a nanosecond time regime.