N93-20099

MOUNTAIN TOP MEASUREMENTS OF BETA(9.2μ)

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Background of the Investigation:

The purpose of this program is to obtain statistical information on the variability of Beta(9.2μ) in clean air on mountain top locations.

Accomplishments in the Past Year:

C.W. CO_2 Lidar

A bistatic C.W. homodyne lidar was assembled using a Synrad, nominal 9.2μ, laser as a source. Even though this laser scanned between 9.2 and 9.3μ, the baseband spectral width of the lidar signal scattered from a target at 100 meters was less than 20 kHz.

A serious problem that became apparent in the operation of the lidar was the difficulty in achieving reliable alignment of the receiving and transmitting optics. The scattering volume formed by the intersection of these optic axes could not be well defined. This point is important because the objective of the program is the measurement of the atmospheric scattering cross-section. Because of this problem, the bistatic lidar approach has been abandoned and a more conventional monstatic lidar is under development.

The monstatic lidar, shown as Figure 1, utilizes most of the components of the bistatic lidar. However, the design requires the use of $\lambda/2$ and $\lambda/4$ waveplates operating in the 9.2-9.3μ spectral range. These are non standard zero order devices and delayed the assembly of the lidar. Final testing of the lidar is now in process.

Data Processor

The Lidar signal processor is basically a four band power spectrum analyzer. Three bands, each 500 kHz wide, pass the doppler shifted back scattered signals corresponding to wind speeds in the range between 2 and 15 m/s. The fourth band is used to establish the noise level of the lidar system.

The signal in each spectral range, suitably conditioned, passes through a wide band, wide dynamic range squaring circuit (AD834). The outputs of each of the circuits is simultaneously integrated, and then periodically sampled and stored in an IBM 286 computer. The average power level in each channel, taking into account system noise from the forth channel is the determined by software.

The system has been tested using digitally generated incoherent pseudo-random noise sources and is able to detect narrow band noise powers of less than 0.1 picowatt in the presence of wide band (full channel) 10 picowatts.

Focus of the Current Research and Plans for the Next Year:

The research plans for the next period center have two objectives;

1. Calibration of the lidar system, and
2. Mountain top observations on Mount Lemmon.

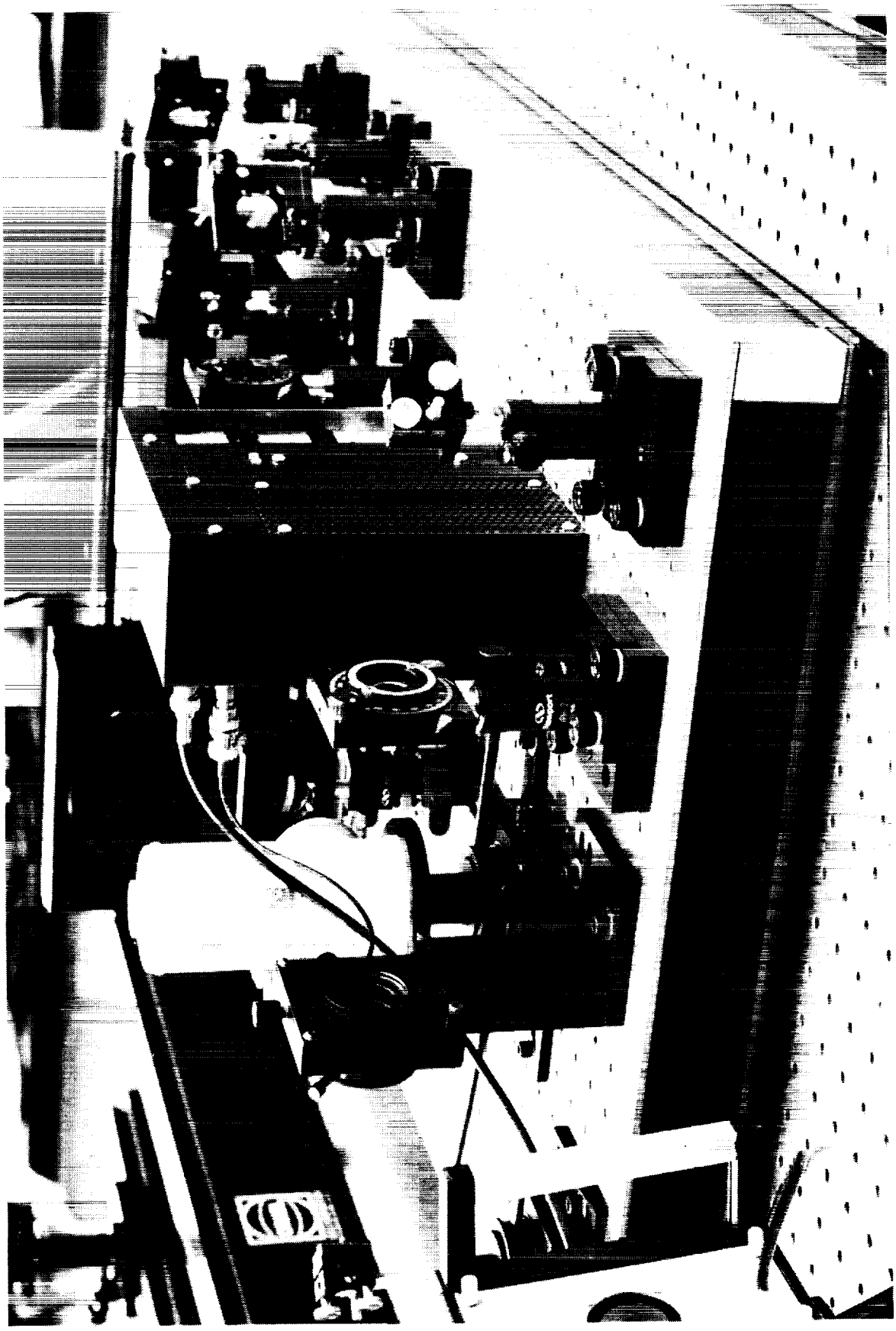

Fig. 1. Monstatic lidar.