



## **Optical design and development of the Near Range Lidar system for aerosol investigation at Belsk**

Michal Posyniak, Aleksander Piatruczuk, and Artur Szkop

Institute of Geophysics, Polish Academy of Sciences, Poland (mpos@igf.edu.pl)

The development of the lidar system in the Central Geophysics Observatory at Belsk (Poland) is presented. Belsk is an aerosol background site located in a rural area about 50 km south from Warsaw.

A new near range (NR) lidar was added to the existing far range (FR) lidar system to enable the acquisition of lidar signals at the distance of a few hundred meters from the device. In the existing design of the FR lidar a 600 mm diameter mirror was used which resulted in an overlap over 1500 mm making this device suitable for observations of aerosols in free troposphere and lower stratosphere but not in the Planetary Boundary Layer (PBL). To enable measurements in the PBL the near range detection system was designed as a complement of the existing FR lidar.

A second telescope with a set of detectors was used with the same laser as in the FR system as a light source. The Nd:YAG pulsed laser generates three wavelengths (1064, 532 and 355 nm). Energies of light pulses are about 320 mJ while their repetition rate is 15 Hz.

In the optical receiver of the NR lidar a telescope with a 150 mm diameter parabolic mirror with optical fiber (1 mm core diameter) as a field stop was used. Our analysis shows that full overlap of the laser beam and the NR telescope field of view is expected at about 150 m. A polichromator based on dichroic beam splitters and a set of narrow band pass filters were used to separate wavelengths. The design of the NR lidar easily allows to add Raman channels to the system.

The acquisition of the analog lidar echoes was done by photomultipliers (at 355 and 532 nm) and the avalanche photodiode (at 1064 nm). 14 bit analog to digital converters coupled with PC computer by USB 2.0 were also used.