[Painel - 14:00]

DEVELOPMENT OF A LIDAR SYSTEM FOR POLLUTION MONITORING OVER THE CITY OF SÃO PAULO

Eduardo Landulfo, Anderson Zanardi de Freitas, Gessé Eduardo Calvo Nogueira, Niklaus Ursus Wetter, Nilson Dias Vieira Junior, Spero Penha Morato
Centro de Lasers e Aplicações - Instituto de Pesquisas Energéticas e Nucleares
Alexandros Papayannis
National Technical University of Athens
Harmi Takiya
Secretaria do Verde e Meio Ambiente - SP
Maria Paulete Pereira Martins Jorge
Laboratório Associado de Meteorologia e Oceanografia - Instituto Nacional de Pesquisas Espaciais

The use of the Mie laser remote sensing technique (LIDAR) gives several possibilities to study the structure of the atmosphere enhancing the effectiveness of air pollution control together with the standard techniques available to the environmental agencies. Following these goals it is proposed here a compact elastic backscattering lidar system to measure the aerosol vertical distribution in the São Paulo urban area. We present here a compact and portable lidar system built to perform daytime and night-time measurements of aerosol parameters such as backscattering ratio and extinction coefficient profiles in the Planetary Boundary Layer (PBL) and the lower free troposphere. The system is designed to be able to retrieve aerosol data up to 5 km range. The system set-up has a 10Hz pulsed Nd:YAG laser source emitting 80 mJ/pulse at 532 nm, and pulse duration of 4 ns, attached to the laser source there is a 30 cm diameter Newtonian telescope (0.9 m equivalent focal length and 1-3 mrad FOV) in a coaxial configuration (fig. 1). The lidar signal should be retrieved by a conventional PMT . In order to achieve a better signal-to-noise ratio the detection system uses a 1 nm FWHM interference filter. The lidar measurements concern the retrieval of the vertical profile of the aerosol backscatter coefficient at 532 nm, using the Klett inversion technique , in the PBL and the adjacent lower free troposphere. Systematic aerosols observations performed during the year 2001 will enable the characterization of the various tropospheric aerosol layers over the city of São Paulo.

[Painel - 14:00]

CALCULATION OF LIGHT PROPAGATION INSIDE A PLANAR WAVEGUIDE USING A MODIFIED SCALAR DIFFRACTION MODEL.

Nicolau A. S. Rodrigues, Rudimar Riva, Marcelo G. Destro, Carlos Schwab
Instituto de Estudos Avançados - CTA
Sandra. S. Sato
Instituto Tecnológico de Aeronáutica

The diffraction calculation is a powerful tool for laser resonator design since it permits a good insight about many important laser beam parameters, such as: transverse mode intensity distribution, mode evolution, diffraction losses and so on. Since it was first proposed by Fox and Li, the diffraction calculation has been used to calculate transverse modes for many different resonators. The same authors deeply investigated the stable resonator, both in the rectangular and in the circular geometry; Rensch and Chester, using basically the same idea, investigated the confocal positive branch unstable resonator; considering a thin sheet of gain medium inserted in the resonator, Fox and Li, and more recently Zaidi and MacFarlane, evaluated the effect of the gain saturation on the resonator transverse mode and, virtually, any open resonator configuration can be analyzed using the basic Fox and Li's idea.
The advent of lasers with slab geometry active medium (slab lasers), mainly RF excited C02 lasers, allowed the development of very powerful and very compact systems. This laser active medium geometry determines, however, strongly nonsymmetric resonators since the transverse dimensions of the active medium are very different: in one direction (say, x direction) the sideways are closely spaced in such a way that the resonator can be considered, basically, an ordinary waveguide; in the other direction (y direction), the sidewalls are separated by a bigger distance and, in order to avoid very high order multimode oscillation, a hybrid unstable resonator is often used.
A numerical model for the mode calculation of strip, waveguide structure, optical resonator is presented in this paper. This model adds to the Fox and Li's approach the kaleidoscopic effect, taking into account the multiple reflections on the sidewalls. As aprevious test, it was assessed in a conventional strip waveguide resonators, resulting in field patterns that agrees quite well with the expected analytical results.

8080