

## EDITOR'S PREFACE

In connection with a wide use of optoelectronics in aerospace systems for monitoring natural resource and ecological state of the Earth's surface as well as when transmitting information and power through the randomly inhomogeneous medium (such as the Earth's atmosphere) it is important to have a correct description of the peculiarities in propagation of optical waves, under conditions of adaptive phase control, for the development of methods and systems of minimizing signal distortions in such systems.

In this connection engineers developing optoelectronic systems have a need of further development of the theory of optical wave propagation under conditions of adaptive phase control at "strong" intensity fluctuations. In that case one should carefully take into account peculiar features of the optical wave phase when developing algorithms for operation of phasometers to be used in optical range.

In late 1980's the authors of the present collection and other scientists began to concentrate their attention on the peculiarities in describing the optical wave parameters under conditions of adaptive phase control, in particular, at strong intensity fluctuations, i.e., when the speckles occur in the field distribution. It is evident that in this case the development of a new mathematical apparatus is required, which would allow one to introduce and describe the so-called phase dislocations in the optical wave when considering adaptive optical systems. Fundamental peculiarities in the optical wave phase fluctuations in the turbulent atmosphere undoubtedly require a more detailed study of the influence of the low-frequency atmospheric turbulence.

Similar studies abroad are being developed very actively. The most important studies in this field are carried out in the USA, Germany, France, Italy, and England. However, in recent years scientists have been working successfully in this field in China, Canada, Australia, Sweden, and Israel. The investigations were found to be very promising on creation of adaptive optical telescopes, telescope-interferometers, and spaceborne photographing systems. In the framework of conversion of the former projects on Strategic Defense Initiative, the USA performs the investigations into the use of high-power lasers for the formation of artificial "reference stars" as well as on the application of lasers to transmission of power to geostationary satellites and stations, i.e., the project SELENE. The development of investigations is possible into constructing monitoring systems operating from the Earth for detecting the dangerous space objects.

In the USA extensive studies are performed aimed at creation of an adaptive spaceborne telescope at the Institute of Space Telescopes, at the Jet Propulsion Laboratory, in the "Adaptive Optics" Association, in the KAMAN Aerospace Corporation.

This paper collection includes the papers by the authors actively working in this field at the Institute of Atmospheric Optics, the Moscow State University, the A.N. Tupolev Kazan' Aviation Institute, and the Institute of Astronomy of the University of Mexico.

Professor V.P. Lukin  
Doctor of Phys.-Math. Sci.