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Arun K. Majumdar
Christopher C. Davis
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Introduction

This volume contains the papers submitted and accepted as full manuscripts following presentation at the Free-Space Laser Communications X conference. The papers in this volume also include papers that deal with imaging through the turbulent atmosphere, especially in the marine layer. Free space optical (FSO) communication is now a mature field, but many exciting fundamental and technological challenges remain to improve its performance in a range of scenarios. The data rates provided by FSO links continue to increase in both long and short range applications. The performance of communication networks containing such links in addition to directional and omnidirectional RF connections continues, however, to present research challenges. Military applications of FSO technology, including the simultaneous use of directional RF communication links involving long range links, with mobile and airborne platforms, remains an area of active research and development. Very long range terrestrial links through the atmosphere can experience severe scintillation caused by atmospheric turbulence, which presents significant challenges in beam pointing and leads to deep fades. Some questions remain regarding how much the performance of FSO links through atmospheric turbulence can be improved with adaptive optics, and how these improvements depend on the length of the link. The performance of free space links can also be improved by forward error correction, interleaving, and packet-level correction codes. Clever transceiver implementations, new beam profiles, and the right modulation schemes can also improve link performance. Non-line-of-sight links using solar blind UV radiation scattered from transmitter to receiver open interesting communication scenarios. There continues to be great interest in modeling the optical channel through the atmosphere for both low and high power lasers. All these issues are addressed in papers published in this volume.

The use of FSO communications in indoor spaces for secure communications and sensor networking over short ranges is attracting attention as a non-interfering alternative to RF communications, and several papers address this important area of research and development. A number of papers describe novel transceiver and sub-system designs for FSO communications, both terrestrial and from ground to space. At a fundamental level, several papers address measurements of the effects of the atmosphere on propagating beam waves, where atmospheric properties can be measured, and correlated with theoretical models describing phenomena such as obscuration, beam wander, scintillation and image motion.

Arun K. Majumdar
Christopher C. Davis