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Optical Solitons in Fibers

Third, Revised and Enlarged Edition
With 91 Figures

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Preface

The optical soliton in fibers presents a beautiful example in which an abstract mathematical concept has produced a large impact on the real world of high technology field. Its existence was theoretically predicted in 1973 and experimentally demonstrated in 1980. However, attempts to implement solitons for ultra-high-speed communications have been a real challenge for many scientists who devoted their interests to this purpose. The challenge has been more fundamental and scientific than technical. For example, the solution of nonlinear Schrödinger equation having periodic variation of coefficients by means of the Lie transformation (to a homogeneous nonlinear Schrödinger equation) is by itself an interesting theoretical contribution. Timing jitter of solitons due to amplifier noise and its control and effects of polarization mode dispersion on soliton transmission are still some other examples. The discovery of the dispersion-managed soliton is an innovative contribution to the application of solitons to a real transmission system.

The research on optical solitons also produced a large impact on conventional optical-transmission technologies. The nonlinear Schrödinger equation model for lightwave envelope and the split-step method of the numerical solution are now widely used as standard techniques in general optical-transmission analyses. The concept of all-optical transmission, first introduced for optical soliton systems, is now used as standard in most recent transmission systems.

This book is the third edition published by Springer-Verlag under this title. The new edition contains many chapters that cover interesting developments that took place in the last decade, including soliton control, effects of polarization-mode dispersion, and in particular the dispersion-managed solitons.

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Kyoto, Osaka,
June 2002

Akira Hasegawa
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