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COMPLEXITY APPROACH OF OPTICAL COMMUNICATIONS SYSTEMS

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Rezumat. *Sistemele actuale de comunicaţii optice au fost studiate pentru a constata existenţa (sau absenţa) principalelor caracteristici ale sistemelor complexe pentru componentele lor, respectiv pentru însişi aceste sisteme ca reţele. A fost studiată prezenţa: a) legilor de tip putere, b) posibilităţilor de ieşire din stările de haos (îndeosebi prin formarea pulsurilor solitonice), c) altor relaţii specifice transformărilor de fază (ex. a relaţiilor de tipul Arrhenius), d) relaţiilor specifice proceselor de creştere (extinderea reţelelor de comunicaţii), etc. Constatările rezultate pot fi utilizate pentru perfecţionarea acestor sisteme, spre ex. pentru mai buna menţinere a profilului pulsurilor solitonice în cursul propagării lor.*

Abstract. *The present optical communications systems were studied in order to find if their components and themselves as a network system have the basic features of the complex systems. There were studied the presence of the: a) power laws, b) specific exits from chaos states (as those corresponding to solitary pulses), c) other relations specific to phase transforms (as the Arrhenius' ones), d) the typical growth relations (for the communications systems development), etc. The resulted findings can be used for the improvement of these systems, e.g. for a better maintenance of the solitary pulses profiles during their propagation.*

Key words: Optical communications systems, Power laws, Solitons, Arrhenius' relations, Communications systems extension

1. Introduction

While the first modern studies of the Information transmission systems appeared in 1928 [1], the first syntheses of the mathematical theories of Communications, of the Information and Complexity, resp. were elaborated by Claude E. Shannon [2] and Warren Weaver [3].

The study of the main modern treatises [4] on the optical transmission of information points out that the: a) solitonic signals present the lowest energy losses (that could be theoretically null in some conditions), b) optical fibers ensure also reduced energy losses, as well as a high rate of the transmitted information, c) lasers with rare earths ions ensure optical signals compatible with the best present optical fibers (those using the silicon dioxide, or with fluorides, resp.), with

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