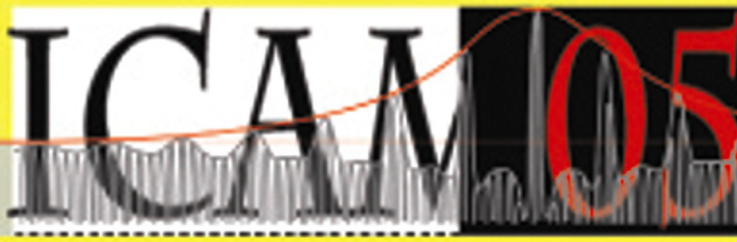

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Stationary Optical Solitons In One Dimensional Deep Nonlinear Bragg Grating And Their Potential Applications

H. Alatas[1], A. Iskandar[1], M.O. Tjia[1], T.P. Valkering[2]

[1)] Dept. of Physics, Institut Teknologi Bandung, Indonesia
[2)] Computational Materials Science Group, Univ. of Twente, The Netherlands

Abstract: In this talk, a brief review of our investigation on the stationary soliton and its related phenomena in one dimensional deep nonlinear Bragg grating system will be given in the framework of a model extended from previous one based on an asymptotic formalism introduced earlier. The modified model takes into account the possibility of strong nonlinear modulation produced by large refractive index contrast or induced by high intensity illumination. The discussion covers both the case of infinite and finite length grating systems. For the infinite-length deep grating system, three important results were found. Firstly, all admitted solitonic solutions of the model were identified and classified, including the existence of new types of solutions in the system, namely the in-gap dark and antidark soliton solutions, along with their exact expressions. Secondly, a simple scheme has been developed for the study of bifurcation processes due to frequency variation. Thirdly, the existence of the dark-antidark rational soliton solutions is established on the bifurcation point. For the finite-length deep Bragg grating system, a simple device model equipped with a continuous wave laser source and a movable metallic mirror was investigated in connection with the possible existence of stationary soliton-like solutions. Taking advantage of the source intensity and the mirror distance as independent control parameters, a numerical calculation was carried out on the model with specific parameters for the study of its potential device applications. Three important results were also found in this case. Firstly, in response to either control parameter, the system was shown to exhibit new types of hysteretic relation between the fields on the opposite grating ends. Secondly, soliton-like profiles could be generated by proper tuning of the source intensity following the hysteretic curve. Thirdly, a transition between dark to antidark soliton-like profiles can be induced by changing the mirror distance as well as the optical intensity. This device offers possible applications for sub-micron displacement sensing and optical switching.