Modeling of Nano-Optical Devices Using Method of Auxiliary Sources

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Research paper presents investigation of new Composite Metamaterial devices that are expected to have a strong impact on future developments in the area of high density integration, communication technology, and bio-medical equipment.

Nanotechnology refers to a field of applied science and technology which theme is the control of matter on the atomic and molecular scale, generally 100 nanometers or smaller, and the fabrication of devices or materials that lie within this size range. Such devices are based on periodic structures, photonic crystals, nano-waveguides structures, nano-antennas, plasmon structures, metamaterials and so on.

The design of large optical components is straightforward because the building blocks are usually well separated. Distances between the elements are so big that the interactions of the field between them can be ignored. Therefore, each element can be developed separately. This is no longer the case when the systems of ultra small devices are planned to design. Especially when the distances between the different devices are in the range of one wavelength, strong interactions between the devices, which are inacceptable for the traditional design process, can be obtained. In this case, it is possible to obtain systems with the desired characteristics taking into account the interactions between the system components. The high complexity of systems of ultra small devices causes a huge variety of potential solutions. Therefore, good or even optimal solutions cannot be found by experiments only. Simulations of user-defined models are helpful, but are time-consuming because of the size of the search space. Therefore, the space of potential solutions should be explored automatically by linking numerical simulations with search.