

عنوان مقاله:

A Different Analytical Approach of Whispering Gallery Modes in Optical Cylindrical Resonator Bio-Sensors

محل انتشار:

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خلاصه مقاله:

Exact positions determination of whispering gallery resonances (WGRs), in cylindrical resonators, specially have an important effect in optical biosensors. WGRs are now known since more than 100 years, after the papers published by John William Strutt (Lord Rayleigh), but their importance as unique tools to study nonlinear optical phenomena or quantum electrodynamics, and for application to very low-threshold micro-lasers as well as very sensitive optical biosensors, has been recognized only in recent years. In this work, a different analytical approach has been presented for solving dispersion equation of WGRs. Whispering gallery resonances in dielectric circular resonators, have two freedom degrees. These degrees, are azimuthal order l and radial order i . For a certain radial order, may be exist some of azimuthal order modes. Analytical formulas of WGRs, have been calculated to forth radial order. This approach, is in good-matching with numerical method. And both of numerical and analytical methods, are in an adequate corresponding with previous researches has been done in this field. This corresponding, is examined with a numerical example. Evanescent field sensing, used in optical biosensors, is strongly depend on caustic radiuses. Concepts of internal and external caustic radiuses and their exact positions, have been presented. It has been shown that, internal evanescent deep is increased, by increasing of mode radial order, which can be useful in liquid core optical ring resonator, (LCORR), biosensors. In this structure, for including a special higher radial order, internal wall, should be positioned just before the internal radius caustic for that mode.

کلمات کلیدی:

Resonator, optical biosensor, whispering gallery, caustic radius

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