Numerical Analysis of Light-wave Scattering from Blue Laser Optical Disk Models with Random Rough Surfaces

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We have analyzed the scattering of an optical wave from various models of optical disk by numerical simulation methods, e.g., the boundary element method (BEM) or the finite-difference time domain (FDTD) method in the previous paper [1, 2]. In general, the boundary surface between two different layers of multilayered disk structure has more or less microscopic roughness.

In order to consider the influences of the surface roughness on the scattering characteristics, we have presented the numerical simulation of the scattering of a Gaussian beam from optical disk structures with random rough surfaces.

In the present paper, the deterioration of the detected signal characteristics due to the surface roughness is estimated by using numerical simulation models. The computer-generated rough surface model [3] is applied to the multilayered disk structures for blue laser. The scattered light-intensity collected in the aperture of an object lens can be calculated by FDTD method. It is shown that the sum- and differential signal outputs are estimated by using numerically calculated scattered intensity of light. An example of the numerically calculated cross talk characteristics between two adjacent recording marks is also shown and discussed.

REFERENCES

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