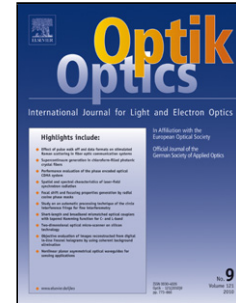


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# Non-reflecting non-magnetic homogeneous polarization splitter and polarization deflector design based on transformation electromagnetics

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## Abstract

In this paper, a non-reflecting non-magnetic homogeneous polarization splitter and polarization deflector design method is proposed and investigated. Transformation electromagnetics is used as a powerful tool to achieve a desired functionality. By applying a proper linear transformation and using the fact that for different polarizations, distinct constitutive parameters appear in Maxwell equations, a non-magnetic homogeneous media is obtained that is reflectionless. Anisotropy factor of the designed media is evaluated and a brief discussion of the available tradeoff is given. To test the method, two typical polarization splitter with positive and negative lateral shift are designed. Also, by modifying the proposed polarization splitter and implementing a metallic coating, a polarization deflector is designed. Functionality of design method is validated using commercial finite element software COMSOL Multiphysics. It is seen that the proposed polarization splitters can successfully create desired separation between polarizations according to the design procedure. Also, the polarization deflector can deflect one polarization with respect to the other one by arbitrary angle.

*Keywords:* homogeneous, non-magnetic, polarization deflector, polarization splitter, transformation electromagnetics.

## 1. Introduction

Since 2006 when Pendry [1] and Leonhardt [2] independently put forward the idea of transformation electromagnetics, it began to widely receive attention, because it gives the designer unprecedented ability to control the electromagnetic wave behavior. These two basic papers invented the cloak of invisibility that was able to redirect the flow of electromagnetic energy around an object. A simplified version of a cylindrical cloak was

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