

Reflection and transmission coefficients at plane interfaces between transformation-optics media

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Abstract

The reflection and transmission phenomena occurring at the plane interface between two transformation-optics media are analyzed. In order to compute the reflection and transmission coefficients the wave vectors and the polarizations of the incident, reflected and transmitted waves are described inside the anisotropic and inhomogeneous media at the interface plane. The reflection and transmission coefficients are derived in terms of the coordinate transformations which are describing the transformation-optics media.

In this work the reflection and transmission at the interface between two transformation-optics media are theoretically studied. Two transformation media joined by a plane interface are considered. When an incident wave propagating inside the first medium arrives at the interface plane, usually, a transmitted wave propagating inside the second transformation medium and a reflected wave propagating inside the first medium will occur.

By heuristic means, was found that when the normal and parallel metrics of the joined transformation media are identical at interface, the incident wave passes into the second medium without being reflected [1]. The concept of transformation-optics was used to design different devices capable to manipulate both the wave paths and the wave vectors of the propagating waves. Some of these devices contain interfaces which have an important role in performing the desired manipulation of the wave paths and wave vectors [2-4]. Also, in the case of these devices, the normal and parallel metrics of the joined transformation media are different at interface. In order to describe the optical properties of these devices, the reflection and transmission coefficients have to be evaluated.

Following the steps of the method proposed in this theoretical study, one can compute the reflection and transmission coefficients at interfaces between two transformation-optics media. The reflection and transmission coefficients are described in terms of the coordinate transformations which are generating the transformation-optics media.

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References

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