Reflectionless ultra-thin microwave wave-plate based on metamaterials

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Abstract
We design an anisotropic ultrathin metamaterial to allow perfect transmissions of electromagnetic (EM) waves for two incident polarizations within a common frequency interval. The transparencies are governed by different mechanisms, resulting in significant differences in transmission phase changes for two polarizations. The system can thus manipulate EM wave polarizations efficiently in transmission geometry.

Backgrounds
1. Polarization has widely applications
2. Some devices are too thick
3. Some devices loss energy

Motivations
1. Anisotropic system
2. Independently transmission
3. Ultra thin
4. Different phase change

Structure
1. A layer: anisotropic electric metamaterials
2. B layer: metallic mesh
3. Thickness of air gap is tunable
4. Illuminated by a normal incident plane wave

Realization

Advantages
1. Flexibly controlling
2. Without energy loss
3. Completely conversion
4. ultra-thin

Conclusions
1. Based on meta-materials
2. Distinct perfect transmission are realized simultaneously
3. Ultra-thin device flexibly control the polarization with perfect efficiency
4. Excellent agreement with theory and experiment

References:
(3) Wujiong Sun, Qiong He, Jiaming Hao, Lei Zhou, Opt. Lett. 36 927 (2011)

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