Effect of Surface Defects on the Amplification of Anomalous Transmission in Dielectric and Metallic Photonic Band Gap Materials: Calculation and Experimental Verification

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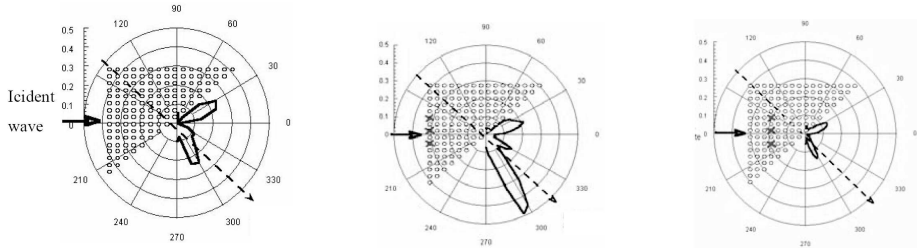
We study the distribution of defects on dielectric and metalic Photonic Band Gap materials. We'll show that the surface defects lead to the amplification of anomalous transmission and excitation of the new electromagnetic modes. These properties allow very interesting applications, such as controlable antennas with high directivity, or compact demultiplexer for WDM [1]. The dielectric and metallic PBG-prisms, which we studied are made of dielectric or metallic rods disposed in an isosceles right-angled triangle.

The Results of the Dielectric PBG-prism

The Fig. 1(a) shows the radiation pattern measured at 16 GHz of a prism without defect.

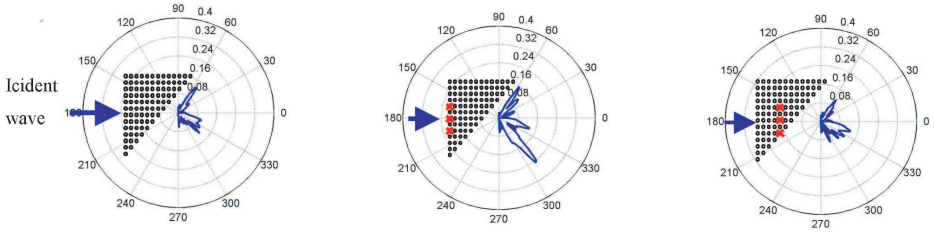


(a) (b) (c)

Figure 1: Measured near field radiation pattern at 16 GHz. a) Perfect PBG-prism, b) The PBG-prism with three cavities (in red) placed on the surface, and c) The PBG-prism with three defects inside.

The Fig. 1(b) gives the radiation pattern measured at 16 GHz of a prism with three defects on the surface of the dielectric. The Fig. 1(c) shows the radiation pattern measured at the at 16 GHz of a prism with three defects inside.

The Results of Metallic PBG-prism



(a) (b) (c)

Figure 2: Measured near field radiation pattern at 12 GHz of metallic PBG-prism. a) Perfect PBG-prism, b) The PBG-prism with three cavities (in red) placed on the surface, and c) The PBG-prism with three defects inside.

The Fig. 2(a) shows the radiation pattern measured at 12 GHz of a prism without defect. The Fig. 2(b) gives the radiation pattern measured at 12 GHz of a prism with three defects on the surface of the dielectric. The Fig. 2(c) shows the radiation pattern measured at the at 12 GHz of a prism with three defects inside.

REFERENCES

1. Lustrac, A. de, T. Brillat, F. Gadot, and E. Akmansoy, "The use of controllable photonic band gap (CPBG) materials: an antenna application," *Optical-and-Quantum-Electronics*, Vol. 34, Nos. 1–3, 265, January–March 2002.