Artificial black holes made with metamaterials

November 16 2010

While our direct knowledge of black holes in the universe is limited to what we can observe from thousands or millions of light years away, a team of Chinese physicists has proposed a simple way to design an artificial electromagnetic (EM) black hole in the laboratory.

In the Journal of Applied Physics, Huanyang Chen at Soochow University and colleagues have presented a design of an artificial EM black hole designed using five types of composite isotropic materials, layered so that their transverse magnetic modes capture EM waves to which the object is subjected. The artificial EM black hole does not let EM waves escape, analogous to a black hole trapping light. In this case, the trapped EM waves are in the microwave region of the spectrum.

The so-called metamaterials used in the experiment are artificially engineered materials designed to have unusual properties not seen in nature. Metamaterials have also been used in studies of invisibility cloaking and negative-refraction superlenses. The group suggests the same method might be adaptable to higher frequencies, even those of visible light.

"Development of artificial black holes would enable us to measure how incident light is absorbed when passing through them," says Chen. "They can also be applied to harvesting light in a solar-cell system."

More information: The article, "A simple design of an artificial electromagnetic black hole" by Wanli Lu, JunFeng Jin, Zhifang Lin, and

Huanyang Chen appears in the *Journal of Applied Physics*. See: link.aip.org/link/japiau/v108/i6/p064517/s1