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Light hits near infinite speed in silver-coated glass

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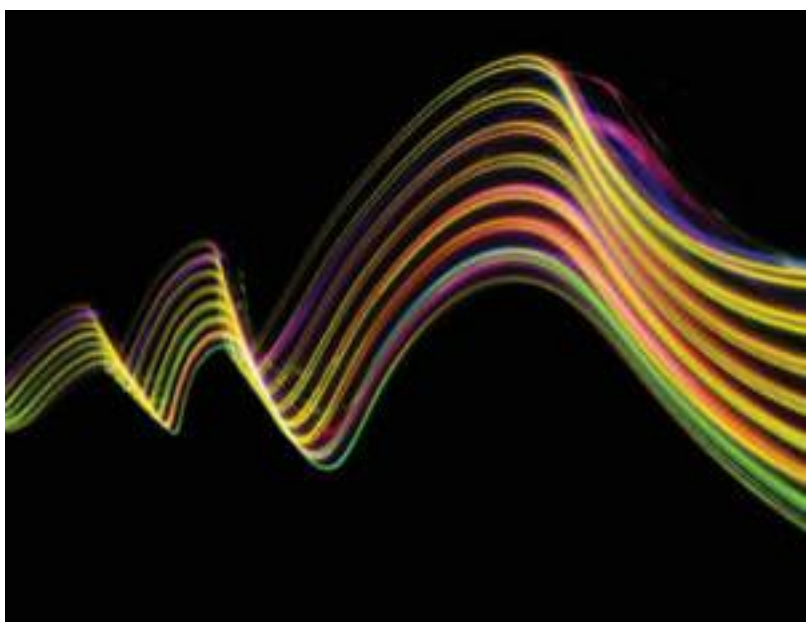

A nano-sized bar of glass encased in silver allows visible light to pass through at near infinite speed. The technique may spur advances in optical computing.

Metamaterials are synthetic materials with properties not found in nature. Metal and glass have been combined in previous metamaterials to bend light backwards or to make invisibility cloaks. These materials achieve their bizarre effects by manipulating the refractive index, a measure of how much a substance alters light's course and speed.

In a vacuum the refractive index is 1, and the speed of light cannot break Einstein's universal limit of 300,000 kilometres per second. Normal materials have positive indexes, and they transmit at the speed of light in a vacuum divided by their refractive index. Ordinary glass, for instance, has an index of about 1.5, so light moves through it at about 200,000 kilometres per second.

No threat to Einstein

The new material contains a nano-scale structure that guides light waves through the metal-coated glass. It is the first with a refractive index below 0.1, which means that light passes through it at almost infinite speed, says Albert Polman at the FOM Institute AMOLF in Amsterdam, the Netherlands. But the speed of light has not, technically, been broken. The wave is moving quickly, but its "group velocity" – the speed at which information is travelling – is near zero.

As a feat of pure research, Polman's group did a great job in demonstrating the exotic features of low-index materials, says Wenshan Cai of the Georgia Institute of Technology, who was not involved in the work.

Practical applications might also be in the offing. The metal component that reduces the refractive index also increases absorption, so the light can't travel far, says Polman. Still, the material could be used to transmit light rapidly over the very short distances in optical integrated circuits, he says.

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Back to top