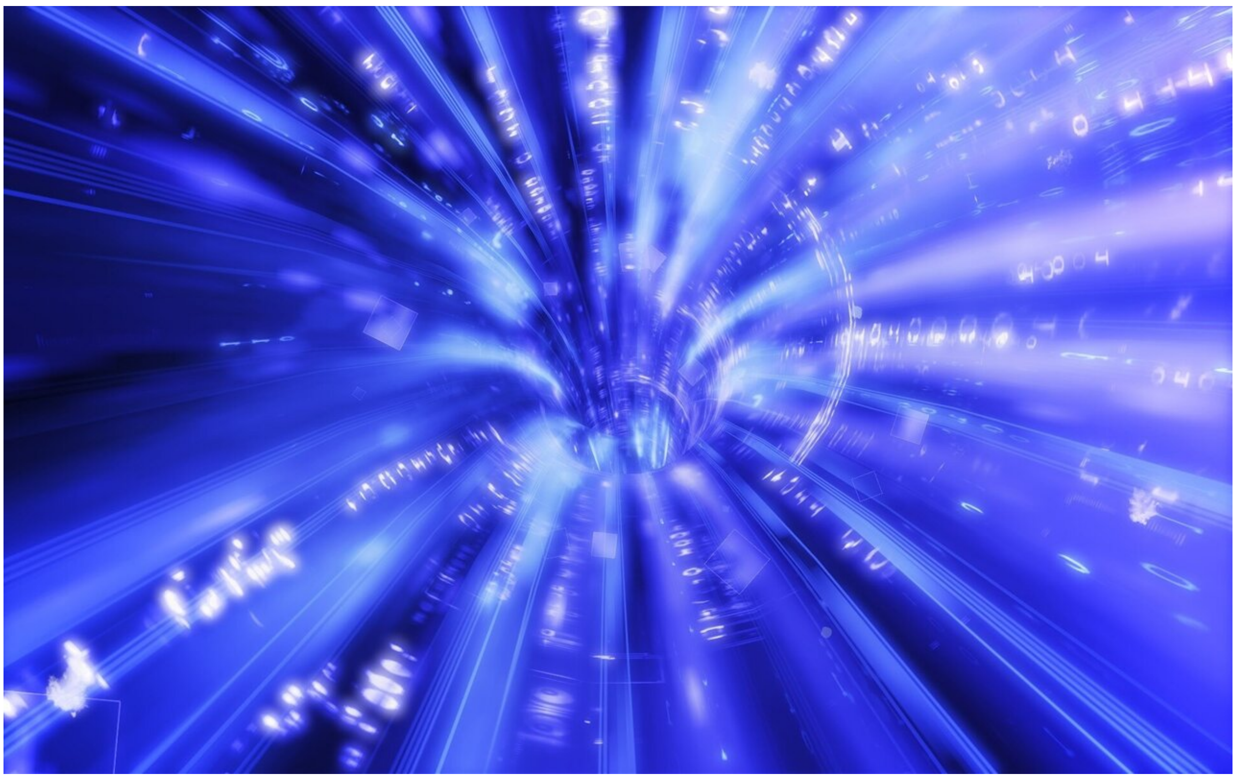
How to see what's on the other side of a wormhole without actually traveling through it

October 13 2020, by Paul M. Sutter



Credit: CC0 Public Domain

Wormholes are incredibly fascinating objects, but also completely hypothetical. We simply don't know if they can truly exist in our universe. But new theoretical insights are showing how we may be able to detect a wormhole—from a spray of high-energy particles emitted at the moment of its formation.

It's easy to describe a wormhole. It's a tunnel through space that connects to distant points in a (hopefully) shorter path. In other words, it's the ultimate shortcut in nature. And while this kind of setup is easy enough to write out in the equations of general relativity (our current ultimate understanding of gravity and how we've revealed the possible existence of wormholes), it's a lot harder to make it work.

Over the decades, scientists have come up with a bunch of possible ways to construct actual wormholes. But every time they do, some quirk of poorly understood physics comes in to ruin the party. For example, wormholes are fantastically unstable—as soon as even a single photon travels down the throat, the entire wormhole rips itself apart at the speed of light, making it less than useful for shortcut purposes.

To stabilize a wormhole, you ultimately need a source of negative mass—matter that has negative weight. That doesn't seem to be possible, so theorists have been kind of stuck.

But in the meantime, it might be possible to find wormholes, and a new paper appearing on the preprint journal arXiv outlines one possible technique.

Here's how it works. Let's say a particle falls into a newly forming wormhole. It can, if it has high enough energy, spontaneously decay into two new particles. One of these particles can escape through the wormhole, while the other can get reflected back through the opening, due to the strange physics operating inside these tunnels.

Then, a new particle enters the wormhole and collides with the reflected particle. The author of the paper found that this collision can reach arbitrarily high energies. This means that what we see on our end of the wormhole could be a shower of high-energy radiation—an unmistakable burst of energy.

Now that we know these kinds of particle showers are possible from opening wormholes, we can look around the universe to see if anything fits the bill… and if we can travel to them.

More information: O. B. Zaslavskii, New scenario of high-energy particle collisions near wormholes. arXiv:2009.11894 [gr-qc]. arxiv.org/abs/2009.11894

Provided by Universe Today