Scientists testing theory that there are multiple universes

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Courtesy of University College London
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A group of physicists claims to be conducting the first test of a theory that holds our universe is just one of many.

Their results? Possible evidence in support of the theory has been found, but more data remains to be examined, they report.

They're looking for disk-like patterns in the cosmic microwave background radiation—a type of heat radiation that permeates the skies and is believed to be left over from the Big Bang, an explosive event that gave birth to our universe. These patterns could provide tell-tale evidence of collisions between other universes and our own, the researchers explain.

The research is described in papers published in the journals *Physical Review Letters* and *Physical Review D*.

An initial proposal describing the idea behind such tests was published in the latter journal in 2007. Many modern theories of fundamental physics predict that our universe is in a bubble, and that there are other bubbles containing other universes, perhaps with different laws of nature. The search for disk-like patterns is based on the notion that universes might knock together. These bumps could then leave round "bruises" on the surface of each colliding universe, like two pears that have been smacked together. These marks would also be reflected in the microwave background—specifically, in the maps that astronomers have put together showing temperature variations in this radiation at different points across the sky.

One problem was that before now, it was hard to search for the disk-like patterns because they could be anywhere in the sky—and have any size. Physicists also needed to be able to test whether any patterns they detected were really the result of collisions or just flukes in the data. "It's a very hard statistical and computational problem," said Hiranya Peiris of University College London, co-author of the research. "But that's what pricked my curiosity."

Peiris and colleagues from Imperial College London and the Perimeter Institute for Theoretical Physics in Waterloo, Ontario, ran simulations of what the sky would look like with and without collisions. The findings also provided an upper limit on how many such bubble collision signatures there could be, the scientists said.

“The work represents an opportunity to test a theory that is truly mind-blowing: that we exist within a vast multiverse, where other universes are constantly popping into existence,” said University College London doctoral student Stephen Feeney, a collaborator on the research. Feeney created a formula to determine whether a model with or without collisions would better fit a wealth of cosmic microwave background data from NASA’s Wilkinson Microwave Anisotropy Probe spacecraft.

One of dilemmas facing physicists is that humans are very good at noticing patterns that may be there only by coincidence. But the new formula is designed to be very hard to fool, imposing very strict rules on whether the data fits a pattern or whether the pattern is down to chance. “It’s all too easy to over-interpret interesting patterns in random data, like the ‘face on Mars’ that, when viewed more closely, turned out to just a normal mountain,” noted Imperial College’s Daniel Mortlock, a co-author of the research.

The search based on data from the NASA probe has turned up four candidate areas in the microwave background that could be the signature of a collision, according to the researchers. But noise in the data makes a definitive conclusion impossible, they added; new data currently coming in from the European Space Agency’s Planck satellite should help solve the puzzle