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'Impossible' EM drive doesn't seem to work after all



EM drives may remain the stuff of science fiction

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By Leah Crane

Space travel powered by an “impossible” engine that breaks the laws of physics sounds too good to be true, and it probably is.

The so-called EM drive – a rocket engine powered by electromagnetic waves – has been touted as a way to eliminate fuel required for deep space exploration. The idea is championed by inventor Roger Shawyer, whose EM drive uses microwaves trapped in a conical cavity to generate thrust. In previous tests by NASA, the microwaves bouncing off the walls of the engine seemed to produce enough force to push the cavity in one direction.

When the idea was first published it grabbed headlines (including a story in *New Scientist* that speculated the EM drive could be “the end of wings and wheels”). But it has long been criticised by physicists who maintain that an EM drive would break one of the most fundamental laws of physics – you can’t get momentum out of nowhere. Now, it seems they were right.

Test drive

The EM drive has been put to the test by a group from TU Dresden in Germany led by Martin Tajmar, who presented their results at the Aeronautics and Astronautics Association of France’s Space Propulsion conference on 16 May. It didn’t pass muster.

The team built their EM drive with the same dimensions as the one that NASA tested, and placed it in a vacuum chamber. Then, they piped microwaves into the cavity and measured its tiny movements using lasers. As in previous tests, they found it produced thrust, as measured by a spring. But when positioned so that the microwaves could not possibly produce thrust in the direction of the spring, the drive seemed to push just as hard.

And, when the team cut the power by half, it barely affected the thrust. So, it seems there’s something else at work. The researchers say the thrust may be produced by an interaction between Earth’s magnetic field and the cables that power the microwave amplifier.

Magnetic interference

Most of their setup was completely shielded from outside fields, but some of the cables did not fit inside the box and there may have been a few centimetres left unshielded, Tajmar says. The current running through those unprotected cables could interact with a magnetic field to push the EM drive forward. When they calculated the strength of this effect, they found that it could produce a few micro-Newtons of thrust. The thrust that they measured from the EM drive was 4 micro-Newtons.

If the drive really is powered by magnetic fields instead of microwaves, it won’t be able to work in space, away from Earth’s magnetic field. Because these tests were run at very low power – an order of magnitude lower than the earlier NASA tests – they’re not yet conclusive. “It’s not for sure that there’s no real signal there, but if it is present it’s very small,” says Jim Woodward at California State University in Fullerton.

Tajmar says that the group will run tests at higher powers within about the next month, and then move on to testing with other frequencies of radiation inside the cavity, cavities with different shapes, and other variations of the EM drive. “It definitely looks more bad than it looked before, but it will take another year of testing before we know for sure,” he says. “I will test everything.”

“This propellant-less propulsion business is regarded by those in the mainstream as speculative at best, and at worst it’s just serious nonsense and people are

wasting their time,” says Woodward. But he adds, “I don’t think this group is wasting their time. If there is a real effect, they’ll find it.”

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