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‘Dark sunshine’ could illuminate the search for dark matter

Illuminating experiment
NASA

The hunt for dark matter could be lit up by the sun. These mysterious particles, which are thought to make up around 85 per cent of the matter in the universe, might be hiding out inside the sun, producing a bizarre form of light. If so, we already have an orbiting experiment that could spot it.

One reason physicists think dark matter exists is because spinning galaxies don’t seem to contain enough mass to hold themselves together – something else must be adding a gravitational tug. Dark matter only interacts with normal matter through gravity, so it can lurk

undetected in massive objects like the sun.

Previous research suggested we could pick up a signature of this dark matter in neutrinos coming from the sun, but we've yet to see any that would serve as a smoking gun.

That's why Jonathan Feng of the University of California, Irvine, and his colleagues say we should be looking for "dark photons" instead. Dark light sounds like an oxymoron, but physicists think there may be a "dark sector" – a shadow realm of particles that mirrors the standard one.

"They are very similar to our photons, just in the dark sector," says Feng. They would be created when two dark matter particles within the sun annihilate each other, releasing energy that would beam out as a kind of dark sunshine.

Although we couldn't see these dark photons directly, they should decay into standard particles like electrons and positrons. And it just so happens the Alpha Magnetic Spectrometer (AMS), a particle detector attached to the International Space Station, is well positioned to catch these positrons.

AMS is positioned to spot positrons originating elsewhere in the galaxy, but Feng says it should be able to catch a proportion of any events from the sun – between one and 10 positrons over the course of three years.

"If you can really pinpoint that the signal is coming directly from the sun, there aren't too many things it can be," says Stephen West of Royal Holloway University in London.

But he warns there might not be any positrons to see. "There is the distinct possibility the dark photons could decay into something equally dark, and then you wouldn't see it."

Still, Feng is sanguine: "Even a few particles detected would be enough to claim discovery."

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