

# New paper offers another approach to proof that dark matter exists

June 30 2011, by Bob Yirka

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(PhysOrg.com) -- In yet another stab at trying to prove the existence of dark matter, Dan Hooper and colleagues have published a paper on *arXiv* describing what they believe to be credible evidence of the material believed to comprise most of the mass in the Universe. They say, according to a recent [BBC post](#), that it could be that electrons are created when high energy dark matter particles crash into one another, giving rise to the synchrotron radiation that has thus far puzzled scientists here on Earth. The result, it is postulated, are the so far unexplained non-thermal radio filaments (NRFs) found near the center of our galaxy.

As the BBC article notes, Hooper gives credit for the idea to fellow team member Tim Linden; a move that may or may not instill confidence in the new theory. Hooper then goes on to say in an interview with BBC news, that the theory does seem to answer a lot of the previously unanswerable questions regarding the mysterious filaments, such as why they are so close to the center of the universe, and why they're so bright. He says that's likely due to there being more dark matter as you approach the center of the galaxy.

In the paper, Hooper et al, note that the filaments trace magnetic field lines, and that others have not had much success in figuring out their origin. They then go on to explain that they believe the creation of [electrons](#) and positrons that make up the filaments is due to the annihilation of some amount of light, dark matter. In addition to confirming their belief that it is this annihilation process that is

responsible for the filaments, they also explain how the characteristics of such events would also explain the excess gamma-ray emissions detected by the Fermi Large Area Telescope and described by the CoGeNT collaboration and also seen in the DAMA/LIBRA experiment in Italy.

Of course, as is noted in the BBC article, basing a new theory on other unproven older theories might in some ways be interpreted as little more than speculation, even if you back up your claims with lots of fancy math.

**More information:** Dark Matter and Synchrotron Emission from Galactic Center Radio Filaments, arXiv:1106.5493v1 [astro-ph.HE]  
[arxiv.org/abs/1106.5493](http://arxiv.org/abs/1106.5493)

### **Abstract**

The inner degrees of the Galactic center contain a large population of filamentary structures observed at radio frequencies. These so-called non-thermal radio filaments (NRFs) trace magnetic field lines and have attracted significant interest due to their hard ( $S_\nu \sim -0.1 \pm 0.4$ ) synchrotron emission spectra. The origin of these filaments remains poorly understood. We show that the electrons and positrons created through the annihilations of a relatively light ( $\sim 5\text{--}10$  GeV) dark matter particle with the cross section predicted for a simple thermal relic can provide a compelling match to the intensity, spectral shape, and flux variation of the NRFs. Furthermore, the characteristics of the dark matter particle necessary to explain the synchrotron emission from the NRFs is consistent with those required to explain the excess gamma-ray emission observed from the Galactic center by the Fermi-LAT, as well as the direct detection signals observed by CoGeNT and DAMA/LIBRA.

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