New paper, may contain a solution to the NuTeV anomaly

Source: http://sci.tech−archive.net/Archive/sci.physics.research/2005−09/msg00402.html

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- *Date*: Fri, 23 Sep 2005 19:56:23 +0000 (UTC)

Hello to all:

I am pleased to announce that my newest paper, "Magnetic Monopoles, Chiral Symmetries, and the NuTeV Anomaly," has now been published at http://arxiv.org/abs/hep−ph/0509223.

This paper is a follow up to my earlier publication at http://arxiv.org/abs/hep−ph/0508257, and takes a closer look at the magnetic monopoles themselves as fermionic particles. I have reported interim progress along the way on the sci.+ boards; now you can see the full picture.

This paper calculates widths and cross sections associated with the predicted magnetic charge, and determines that there is a very slight cross−section enhancement at sqrt(s) = M_z ~ 91 GeV due to magnetic monopoles.

If one were to do experiments and NOT understand the magnetic monopole origin of this small cross section enhancement, one might instead conclude that the weak mixing angle had decreased for e/ebar scattering, in relation to neutino/neutrino−bar scattering, by a small amount. How small? This paper predicts a reduction of approximately .003, which is right near the magnitude of the NuTeV anomaly and goes in the right direction as well.

Fundamentally, the NuTeV anomaly is thus seen to be the first experimental evidence of the existence of the magnetic monopole charges, which have been a mystery ever since Maxwell's era.

Also, some fundamental connections are drawn between the magnetic / electric symmetries, and chiral symmetries.

If you want the quick tour, look at equations (9.12) to (9.15) which contain the final numeric results. Then look at (8.16) through (8.20) which shows these same results represented in term of the cross section enhancements from which they were derived.

If you are doing NuTeV experiments, and even if not, look at (7.34) to

(7.44), which show the full and differential cross sections in the most general form. This should help you with the NuTeV anomaly even if you don't believe as I do that the magnetic monopole charge at least contributes to this anomaly. Because these equations tell you how a vector boson (call it the Z^u' if you wish) with mass > M_z would enhance the cross section generally, whether the origin of that vector boson is from magnetic monopoles or somewhere else. So, these give you a theoretical framework to fit the data under a variety of assumptions that you may wish to make.

If you assume two or more massive bosons with mass > M_z, then there will be further cross section terms for each new vector boson, as well as further cross terms between pairs of vector bosons, the form of which can readily be understood and deduced from (7.34) to (7.44). My own suspicion is that there is also an electroweak−based Z^u' in the 1.3 TeV range in addition to the M^u which mediates the magnetic monopole interaction here. This will require extending the entire electroweak theory to consider weak and weak hypercharge magnetic monopoles, and may well be the subject of my next paper.

Once the cross section enhancement is known under whatever scenario one may assume, the apparent impact on sin^2 theta_w can be deduced following the steps shown in section 9. So, there is some good grist here for the NuTeV folks. And for anyone who is interested in understanding magnetic monopoles and chiral symmetries.

I also suggest a look at the conclusion.

>From there, look at whatever you want.

Happy reading.

Jay.

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