

January 21, 2013

Dear Colleague,

This is a letter on behalf of Jennifer Kile, who is applying for a postdoc position in your group. Jennifer is a postdoc associate at Northwestern under my supervision. She joined our group in the Fall of 2010 and will be with us until the end of next summer.

Jen and I have, so far, concluded one research project. Our results are described in arXiv:1207.0510. In more detail, together with Wei-Chih Huang, a postdoctoral fellow at SISSA, we investigated the possibility that the dark matter is a component of a new fermion multiplet that transforms as a large representation of $SU(2)_L$. Jen was the primary author of this paper, with Wei-Chih closely behind, and was responsible, for example, for writing the entire text. Our goal was to ask whether (a) it was possible that all of the dark matter mass was generated via electroweak symmetry breaking and (b) the dark matter particle could be stable due to an accidental symmetry. Along the way, we studied the conditions required for adding new chiral fermions to the standard model that don't mix with ordinary standard model fermions, receive all of their mass from electroweak symmetry breaking, and contain only massive new particles. Our results are very interesting and exemplify how hard the task we set out to accomplish was. Independent from the dark matter question, the new class of weakly-charged fermions we identified serves as a very simple extension of the standard model that will necessarily be probed in the near future by the LHC. Understanding the phenomenology of these scenarios is high on my to-do list and hopefully a subject that Jen and I will return to in the very near future.

Currently, Jen is involved in a couple of research efforts, and we have a couple of other ideas in the pipeline. In particular she is leading a project on lepton-flavored dark matter together with one of my younger graduate students. She has been spending the majority of her time, since the completion of our last preprint, on a very ambitious project to understand, technically speaking, the standard model computation of the well-known physics process $h \rightarrow \gamma\gamma$, especially how the result connects with gauge-invariance. Ultimately, the goal is to establish a relationship between this and related results to the so-called gauge hierarchy problem, hoping to make the problem less ambiguous and more physical. Jen plans to make her results public in the very near future. I have learned a lot from our discussions related to the subtlety of regularizing and renormalizing spontaneously broken gauge theories, computing $h \rightarrow \gamma\gamma$ using different "prescriptions," and understanding the gauge hierarchy problem – a subject that continues to puzzle me after all these years.

Over the past two years or so, I have learned that Jen is a very thoughtful scientist, with excellent computation tools and a very solid grasp of several topics related to particle physics research, including flavor physics and astroparticle physics and cosmology. She also has very good taste when it comes to physics problems.

Her biggest weakness is her productivity, which is quite low compared to other particle physicists at the same stage in her career. This is an unfortunate side effect of

her independence and the fact that she works very thoroughly on interesting research projects, and the fact that she does not buy into fads and avoids ambulance chasing, perhaps to a fault. In order to remedy this, Jen needs a more “pushy” supervisor, a quality which I, alas, certainly do not possess.

Jen is very easy to get along with, and is an excellent resource for students and other postdocs. She is also an excellent speaker and communicator.

I recommend Jen strongly. She is an excellent particle theorist and I urge you to consider her seriously. I believe you will not be disappointed.

Sincerely,

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