

Recommendation letter

for Venus Ebrahimi-Keus

This is a recommendation letter in support of Venus Ebrahimi-Keus, a young and very motivated researcher, who is applying for a postdoctoral position in your group.

I know Venus since the beginning of 2009 when she started the PhD studies under my supervision. Although her educational background back in Iran and later in Europe was related to quantum physics but it didn't include the quantum field theory or particle physics, it was compensated by her remarkable enthusiasm about the fundamental physics. Starting from the very first days in our group she embarked on learning QFT and particle physics, taking doctoral courses and studying some subjects on her own. It is not very often that one sees such a strong and lasting determination in students.

The subject of her PhD thesis, which she successfully defended in September 2012, was symmetry properties of the scalar sectors in multi-Higgs-doublet models. Although additional symmetries are the key ingredients in many models beyond SM, the systematic exploration of their role in multi-doublet models was largely missing until very recently. So, I suggested to Venus to join my ongoing project on understanding which symmetry groups can be implemented through the Higgs potential in these models and what are their phenomenological consequences.

In a matter of three years, Venus jumped into research and actively participated in several works within this project. She coauthored four papers, three of which already published, and gave several talks on her research activity. The most challenging to her was, perhaps, a long project on full classification of abelian groups which can be realized as symmetry groups in the scalar sector of multi-doublet models for any given number of doublets. I'd like to stress that this work was rather mathematical (it was published in J. Phys. A: Math. Theor.) even by standards of experts in the beyond-SM community. Nevertheless, Venus patiently went through subtleties and tried to rederive every statement and theorem. During this work I noticed her ability to focus on long analytical calculations, which contrasts her to many other PhD students I see.

On a more phenomenological note, we discussed a special class of symmetries arising in models with three or more doublets, which we termed frustrated symmetries due to their mathematical similarity to the phenomenon of frustration in condensed matter physics. Continuing the abelian group study, we demonstrated that such symmetries naturally lead to multi-inert models, with scalar dark matter candidates stabilized by the Z_p symmetry groups (instead of the usual Z_2 symmetry). Very recently, we also suggested a cute and efficient geometric approach to minimization of symmetric potentials, to which Venus also contributed.

Venus is a young researcher with a remarkable drive towards theoretical physics. She has already certain experience in mathematical issues related to model-building in Higgs sectors beyond SM and in their astroparticle aspects. However she is also looking to expand her knowledge in HEP by working on other subjects within particle physics. I definitely support Venus's application for a postdoctoral position in your group. Being immersed in its scientific environment will be of huge benefit for her, and I believe her stay will also be valuable for your group.

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