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Letter of Recommendation for Shabbar Raza Rizvi

I am delighted to recommend my student Shabbar Raza for a postdoctoral appointment in your department. I believe his research interests overlap and also nicely complement the cutting edge research being carried out in your very productive group.

Shabbar has assembled a very impressive research portfolio and I fully expect him to complete his PhD in the early part of 2013. Shabbar has so far co-authored eight papers, many of which have already been published in prestigious journals including Physics Letters B, Journal of High Energy Physics and Physical Review D. His main research is centered on physics beyond the Standard Model (SM) of strong, weak and electromagnetic interactions. In particular, he works on supersymmetric theories, widely regarded as the most compelling extension of the SM. These theories are presently undergoing stringent tests at the Large Hadron Collider (LHC) at CERN, Geneva.

Shabbar has made several major contributions to supersymmetric models in which the third family Yukawa couplings are unified at the grand unification scale. His recent paper (hep-ph: 1201.5668), has emphatically disproved a long held belief among many experts in this field that the color gluino (supersymmetric partner of the color gluon which holds the quarks together inside the proton) cannot be much heavier in these models than about 500 GeV. Shabbar's paper shows that the gluino can weigh as much as 3 TeV, and it also discusses signals through which such a heavy gluino can be discovered at the LHC.

Shabbar's paper on b-tau Yukawa unification (PLB 706, 345 (2012)) proves that this condition imposed in the framework of the simplest supersymmetric models yields only a single solution that is compatible with the WMAP dark matter constraint. This paper shows that the dark matter particle is the lightest (stable) neutralino accompanied by a slightly heavier top squark. This result is quite exciting because a light top squark can be discovered at the LHC and moreover, it can play a crucial role in explaining the observed baryon asymmetry of the universe!

Shabbar's paper on gauge-Yukawa unification exploits higher dimensional unified models of strong, weak and electromagnetic interactions. For a long time it was not clear how one should go about experimentally testing such theories. This paper shows that imposition of the gauge-Yukawa unification condition yields some very elegant solutions for the masses of the Higgs boson, dark matter and supersymmetric partners of the SM particles which can be tested at the LHC.

To summarize, Shabbar is one of our very best graduate students who has been extraordinarily successful in his research projects. I recommend him for the postdoctoral fellowship in the strongest terms.

Sincerely,

Qaisar Shafi  
Inaugural Bartol Research Institute Professor of Physics  
Dept. of Physics & Astronomy  
University of Delaware