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Dear Sirs,

This is a recommendation letter for Costas Pallis applying for a position in your Institute. I have known Costas since 1993 when I selected him to visit Ecole Polytechnique, via the ERASMUS program, in order to perform his Diploma Thesis. From October 1995 until June 2000, he was a Postgraduate student in our Department under my supervision.

Costas has successfully calculated analytically as well as numerically the annihilation cross section of the lightest supersymmetric particle in the case where this particle is mainly a bino. He also conducted a complete evaluation of the coannihilations of this particle with the next-to-lightest supersymmetric particle in the case where this is the lightest stau. These calculations, which are quite extensive, were, for some time, the only ones in the literature which were accurate for all values of $\tan\beta$, small, intermediate or large and they are very well cited. Moreover, he performed, in the context of the minimal supersymmetric standard model, full one-loop (and in some cases two-loop) renormalization group calculations, (s)particle mass corrections and the analysis of the minimization conditions of the effective potential for the electroweak symmetry breaking. Finally, he included a calculation of the branching ratio of $b \rightarrow s\gamma$ to two loops in the same context.

He used these calculations in order to restrict the parameter space of the minimal supersymmetric standard model for both signs of μ in the case of full Yukawa coupling unification and thus large $\tan\beta$. These calculations have been extended to the case of Horava-Witten boundary conditions with no, partial or full Yukawa unification.

He then studied the constrained minimal supersymmetric standard model, but replacing exact Yukawa unification by a Yukawa quasi-unification condition which naturally arises in grand unified models such as the Pati-Salam model. This condition allows us to achieve an acceptable b-quark mass for both signs of μ . It was shown that for μ positive there is a wide range of parameters which is compatible with all available phenomenological and cosmological constraints. On the contrary, the μ negative case is excluded. Finally, he investigated the consequences of b-tau Yukawa unification in the minimal supersymmetric standard model with universal and nonuniversal boundary conditions. He calculated the scalar neutralino-proton cross section and discussed the detectability of the neutralino.

Costas then continued his work on his own. He analyzed the decoupling of a cold relic during a decaying-particle-dominated cosmological evolution and investigated scenarios of equilibrium or non-equilibrium production. He showed that the reheat temperature must be lower than about 20 GeV. He also studied thoroughly the low energy consequences of the asymptotic b-tau Yukawa coupling unification with universal or non-universal boundary conditions and derived restrictions on the parameter space. He then worked on his own as well as in collaboration with others on aspects of hybrid inflation, quintessence and on the calculation of the relic abundance of the lightest neutralino according to non-standard cosmological scenarios. Also, we worked together on how to reduce the spectral index in hybrid inflation models by a supplementary modular inflation so as to become compatible with the recent three-year WMAP measurements.

Recently, he worked with me and my Ph.D. student N. Karagiannakis on a generalized Yukawa quasi-unification condition in the constrained minimal supersymmetric standard model which allows us to restore the viability of this model which was jeopardized by the most recent experimental results on $B_s \rightarrow \mu^+ \mu^-$ and the Higgs boson mass. Our results are about to be released. Needless to say that Costas' participation was a crucial help for the completion of N. Karagiannakis's work for his Ph.D. thesis. He also participates in our work on leptogenesis with another young researcher R. Armillis.

I have an excellent opinion about him. He is an extremely hard working young scientist, determined to succeed. He has already a wide and sound scientific background which includes not only relic density, inflationary, and minimal supersymmetric standard model calculations on which he has mainly worked, but also neutrino physics and baryogenesis/leptogenesis since he also worked with me on these subjects in the earlier stages of his Postgraduate studies.

He can concentrate on the real physical aspects of each problem and he has the technical skill to perform quickly complicated analytical as well as numerical computations. He also contributes in grasping and developing new ideas and approaches. He is certainly not lacking imagination and originality. His contribution to our common work so far has been valuable and essential in all the stages of the work, from the idea to the computation and interpretation of the results. He also has a very pleasant and kind personality, gets very well along with people and is always open to scientific discussions and collaborations.

I very highly and warmly recommend him for the position in your Institute.

Yours sincerely,

George Lazarides

Sincerely Yours,

G. Lazarides