CURRICULUM VITAE

1. PERSONAL DATA

Name: Athanasios DEDES

Date of birth: 1 November 1969

Place of birth: Prokopi, Evia, Greece

Nationality: Greek

Marital Status : Married (to Panagiota Kanti, Associate Professor at the Department of Physics, University of Ioannina, Greece)

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2. EDUCATION

- **1982-1988:** Secondary Education at the High School of Psachna, Evia, Greece.
- **1988-1992:** Bachelor in Physics at the University of Ioannina, Greece.
- **1992-1994:** Graduate Studies in Theoretical Physics at the University of Ioannina (courses included Quantum Field Theory, Advanced Mathematics, Classical Electrodynamics and Statistical Mechanics).
- **1994-1998:** PhD in Particle Physics entitled "Radiative Breaking of Gauge Symmetries in the MSSM and in its Extensions" (hep-ph/9803339) at the Physics Department of the University of Ioannina under the supervision of Prof. Kyriakos Tamvakis.
- **2004-2006:** Post-Graduate Studies at the University of Durham for the "Teaching and Learning in Higher Education" Certificate.

3. RESEARCH AND ACADEMIC POSTS HELD

- **1998-2000:** Post-Doctoral Research Associate – "Marie Curie" European Fellow – at the Rutherford Appleton Laboratory, Oxford UK.
- **2000-2002:** Post-Doctoral Research Associate – Fellow of the Research and Training European Network (RTN) "Physics Across the Present Energy Frontier" – at the Theory Division, University of Bonn, Germany.
- **2002-2003:** Non-permanent staff member (C1 6-year position) at the Division of Nuclear and Theoretical Physics of the Technical University of Munich, Germany.
- **2003- 2007 :** Lecturer (non-fixed-term position) at the Institute for Particle Physics Phenomenology (IPPP) at the University of Durham, UK.
- **2007- ... :** Associate Professor at the University of Ioannina, Greece.

4. MEMBERSHIP OF PROFESSIONAL OR SCIENTIFIC BODIES

Since October 2003, I am a member of the Association of University Teachers (AUT). Also, since April 1998, I am a member of the Society of the Greek High-Energy Physicists.

5. FELLOWSHIPS – SCHOLARSHIPS – AWARDS

• 6-year Fellowship from the "German (Bavarian) Studies Council" at the Division of Nuclear and Theoretical Physics of the Technical University of Munich, Germany (2002-2008).

• 2-year Fellowship of the European Research and Training Network (RTN) "Physics Across the Present Energy Frontier" at the University of Bonn, Germany (2000-2002).

• 2-year "Marie Curie" European Fellowship at the Rutherford Appleton Laboratory , Oxfordshire, UK (1998-2000).

• 5-year "Special Graduate Scholarship" from the Greek Ministry of Education at the University of Ioannina, Greece (1992-1997).

• Special Prize in the "Summer School of Advanced Physics" organised by the Institute of Technology and Research, University of Crete, Greece (1992).

• The "Greek State Scholarship Foundation" prize for the second best grade, during the first (1988-1989) and third (1990-1991) year of my undergraduate studies.

• The 3rd prize in the "European Contest for Young Scientists" organised by the "Greek Mathematical Society", for the research project "Water Powered Engine" (1990).

6. LANGUAGES

Besides Greek (mother-tongue), I speak English and basic German.

7. SCHOOLS AND CONFERENCES ATTENDED

Since 1992, first year of my graduate studies, and until today, I have attended the following schools and conferences:

1. 1-28 July 1992 : "Summer School of Advanced Physics", Heraklion, Crete, Greece.

2. 13-15 January 1994 : "Workshop on Recent Developments in High Energy Physics", Athens, Greece.

3. 11-22 April 1994 : "Spring School and Workshop on String Theory, Gauge Theory and Quantum Gravity", Trieste, Italy.

4. 26 December 1994 - 3 January 1995 : "Jerusalem Winter School for Theoretical Physics", Jerusalem, Israel.

5. 15-19 May 1995 : "SUSY'95", Ecole Polytechnique, Paris, France.

6. 3-6 April 1996 : "Workshop on Recent Developments in High Energy Physics", Ioannina, Greece.

7. 14-18 April 1997 : "Duality and Supersymmetric Theories", Cambridge, UK.

8. 11-17 July 1998 : "SUSY 98", Keble College, Oxford, UK.

9. 16-18 December 1998 : "Annual UK Theory Meeting", Rutherford Appleton Laboratory, UK.

10. 15-17 December 1999 : "Annual UK Theory Meeting", Rutherford Appleton Laboratory, UK.

11. 19-24 September 1999 : "Collider Workshop", Durham, UK.

12. 12-14 May 2000 : "Workshop on Continuous Advances in QCD", Minneapolis, USA.

13. 14-16 December 2000 : "Annual UK Theory Meeting", Rutherford Appleton Laboratory, UK.

14. 26 February 2004 : "Neutrinoless Double Beta Decay Workshop", University of Sussex, UK.

15. 6-7 April 2004 : "Particle Physics 2004", Birmingham, UK.

16. 21-23 April 2004 : "Neutrinoless Double Beta Decay Phenomenology", Durham, UK **(member of the organising committee)**.

17. 16-19 December 2004 : "Annual UK Theory Meeting", Durham, UK.

18. 4-6 April 2005 : "Babar Meeting", Durham, IPPP, UK.

19. 29 June - 15 July 2005 : "PRE-SUSY'05", Durham, IPPP, UK **(chairman of the organising committee)**.

20. 17-23 July 2005 : "SUSY'05", Durham, IPPP, UK **(chairman of the organising committee)**.

Since the end of my PhD in 1998, I have given oral presentations in the following workshops and conferences:

1. 9-11 April 1998 : "Workshop on Recent Developments in High Energy Physics", Athens, Greece.

2. 27 June - 3 July 1999: "XIth Rencontres de Blois: Frontiers of Matter", Blois, France.

3. 23 August - 10 September, 1999 : "XXth UK Theory Institute", University of Wales, Swansea, UK.

4. 19-24 September, 1999 : "UK Phenomenology Workshop on Collider Physics", Durham, UK.

5. May 2000 : "Beyond the Standard Model Meeting", Glasgow, UK.

6. 26 June - 1 July 2000 : "SUSY 2000", CERN, Geneva, Switzerland.

7. 11-17 March 2001 : "Electroweak Interactions and Unified Theories", XXXVIth Rencontres de Moriond, Les Arcs, France.

8. 11-16 May 2001 : "Planck-2001", La Londe-les-Maures, Loire, France.

9. 18-30 May 2001 : "Les Houches Workshop: Physics at TeV Colliders", Les Houches, France.

10. 8-15 September 2001 : RTN "Physics Across the Present Energy Frontier" Meeting, Corfu, Greece.

11. 11-14 March 2002 : "XIV Workshop Beyond the Standard Model", Bad Honnef, Germany.

12. 17-23 June 2002 : "SUSY 2002", DESY, Hamburg, Germany.

13. 11-14 December 2002 : RTN "Physics Across the Present Energy Frontier" mid-term Meeting, Ecole Polytechnique, Palaiseau, France.

14. 5-9 April 2003 : "Workshop on the CKM Unitarity", IPPP, Durham, UK **(Invited)**.

15. 8-10 May 2003 : "Workshop on the Discovery Potential of an Asymmetric B Factory at 10^{36} Luminosity", SLAC, Stanford University, USA **(Invited)**.

16. 29 July - 4 August 2003 : "String Phenomenology", IPPP, Durham, UK. **(Invited)**.

17. 21-23 April 2004 : "BaBar Meeting 2004", Durham, UK **(Invited)**.

18. 24-28 May 2004 : "Planck04", Bad Honnef, Germany **(Invited)**.

19. 17-23 June 2004 : "SUSY 2004", Tsukuba, Japan.

20. 6-8 July 2004 : "LHCb Meeting", Glasgow, UK **(Invited)**.

21. 5-8 January 2005 : "UK HEP Young Experiment-Theory", Durham, UK **(Invited)**.

22. 21-24 April 2005 : "Workshop on Recent Advances in Particle Physics and Cosmology", Thessaloniki, Greece **(Invited)**.

23. 6 June 2005 : "IoP Meeting on Neutrinos", Manchester, UK **(Invited)**.

24. 12-17 June 2006 : SUSY 2006, 14th International Conference on Supersymmetry and the Unification of Fundamental Interactions Irvine, California, USA **(Invited plenary)**.

25. 9-13 June 2007 : Planck'07 , From the Planck Scale to the Electroweak Scale, Warsaw, Poland **(Invited plenary)**.

26. 27-28 September 2007, 1st ARTEMIS Annual Meeting, Chalkidiki, Greece.

27. 19-23 December 2007, From Strings to LHC II, Bangalore, India **(Invited)**.

8. LONG-TERM SCIENTIFIC VISITS – SEMINARS

As a long-term visiting scientist, I have visited the following academic and research institutes: the Theory Division of the European Center for Nuclear Research (CERN) in Geneva, Switzerland (in 1993, 1995, 2002 and 2003); the Department of Theoretical Physics of the University of Oxford, UK (in 1998, 1999 and 2000); the Theoretical Physics Institute at the University of Minnesota, USA (in 1999 and 2000); the Scuola Normale Superiore in Pisa, Italy (in 2001 and 2002); the Department of Applied Mathematics and Theoretical Physics (DAMTP) at the University of Cambridge, UK (in 2000); the Nuclear Physics Laboratory at DESY, Hamburg, Germany (in 2000); the Division of Theoretical Physics of the University of Manchester, UK (in 2004).

In addition, since 1998, I have been invited to give seminars at the following academic institutions:

• the Theoretical Physics Institute (TPI), University of Minnesota, USA
• the Particle Physics Division of the Rutherford Appleton Laboratory, Oxfordshire, UK
• the Physics Department of the University of Wisconsin, Madison, USA
• the Theory Division of the European Center for Nuclear Research (CERN), Geneva, Switzerland
• the Scuola Normale Superiore, Pisa, Italy
• the Theory Division of the Physics Department, University of Bonn, Germany
• the Theory Division of the Physics Department, University of Frieburg, Germany
• the Division for Nuclear and Theoretical Physics, Technical University of Munich (TUM), Germany
• the Division of Theoretical Physics, University of Ioannina, Greece
• the Institute for Particle Physics Phenomenology, Durham, UK

• the Division of Theoretical Physics, Aristotelian University of Thessaloniki, Greece
• the Department of Theoretical Physics, University of Oxford, UK
• the Division of Theoretical Physics, University of Manchester, UK
• the Physics Department of the University of Liverpool, UK
• the Division of Experimental High-Energy Physics, Imperial College, London, UK
• the Division of Theoretical Physics, University of Glasgow, UK
• the Division of Theoretical Physics, University of Lancaster, UK
• the Division of Theoretical Physics at DESY, Hamburg, Germany
• the Stanford Linear Accelerator Collider (SLAC), Stanford University, USA
• the Department of Applied Mathematics and Theoretical Physics (DAMTP), University of Cambridge, UK.
• the Departamento de Fisica Teorica C-XI, Universidad Autonoma de Madrid, Spain.

9. COMPUTING SKILLS

I have a good knowledge of FORTRAN which I have mainly used for numerical integration and the solution of coupled systems of differential equations. For the needs of my PhD, I constructed a FORTRAN program which solves the two-loop renormalization group equations (RGE) in the MSSM with all threshold effects taken into account. As I explain below, this program now contains more than 10000 lines and it is very useful in connecting theoretical models to experimental data. In addition, I have used the Mathematica package for symbolic calculations as well as graphic packages such as Xmgr, Gnuplot and Topdrawer.

10. ADDITIONAL SCIENTIFIC ACTIVITIES

As a member of the Organising Committee, I have contributed to the organisation of the following conferences and workshops:

(i) : "SUSY 2005: the 13th International Conference on Particle Interactions and Unification", Durham, UK (18-23 July 2005) – **chairman of the organising committee**.

(ii) : "PRE-SUSY 2005 Workshop", Durham, UK (29 June - 15 July 2005) – **chairman of the organising committee**.

(iii) : "Neutrinoless Double Beta Decay Phenomenology", Durham, UK (21-23 April 2004).

(iv) : "1st Hellenic Conference of Physics Students", Ioannina, Greece (May 1992).

As a staff member at the University of Durham, I have been organising two seminar series: the "Particle Physics" with speakers from the UK and international particle physics community, and the "Journal Club", a weekly event for our local group in which interesting scientific papers are discussed. As a post-doctoral research associate at the University of Bonn, Germany, I also organised the "Particle Physics and Cosmology" seminar series.

During the period 2003-2005, I participated in Undergraduate interviews, Postgraduate Admission Interviews and in Masterclass for Particle Physics. I also examined candidates in

Level 3 Poster session, and acted as shepherd and experiment demonstrator in "Open Days". Finally, I participated in the mark checking and sorting of the examination papers.

In addition, I regularly act as a referee for the following scientific journals: *Physical Review Letters*, *Physical Review D*, *Physics Letters B*, *Nuclear Physics B*, *European Journal of Physics*, *Europhysics Letters*, *Journal of Physics G*.

Finally, I have acted several times as a referee for research proposals submitted to the Particle Physics and Astrophysics Research Council (PPARC) for Post-doctoral/Advanced Fellowships and Special Grants.

11. TEACHING EXPERIENCE

My teaching experience is summarised below in reverse chronological order:

• 2004-2005 :

(i) Teaching of the Undergraduate Course "Advanced Quantum Mechanics" (3rd year) at the Physics Department, University of Durham.

(ii) Teaching of the Postgraduate Course "Overview of Particle Physics" at the Centre for Particle Theory, University of Durham.

(iii) Tutorial classes on "Computational Physics" (3rd year) at the Physics Department, University of Durham.

(iv) Tutorial classes on "Physics Essays" (2nd year) at the Physics Department, University of Durham.

• 2003-2004 :

(i) Teaching of the Postgraduate Course "Overview of Particle Physics" at the Centre for Particle Theory, University of Durham.

(ii) Tutorial classes on "Physics Essays" (2nd year) at the Physics Department, University of Durham.

• 2002-2003 :

(i) Tutorial classes on "Quantum Mechanics" (3rd year) at the Technical University of Munich, Germany.

• 1993-1997 :

(i) Tutorial classes on the Undergraduate Courses of "Classical Mechanics I & II" (3rd year), "Quantum Mechanics I & II" (3rd year) and "Quantum Field Theory" (4th year) at the Physics Department, University of Ioannina, Greece. More analytically:

Academic Year	**Winter Semester**	**Spring Semester**
$1993-1994$	Quantum Mechanics I	Quantum Mechanics II
$1994-1995$	Quantum Mechanics I	-
$1995-1996$	Classical Mechanics I	Classical Mechanics II
$1996-1997$	-	Quantum Field Theory

My duties as a tutor at the University of Ioannina included the solution of problems inside the class and question sessions with the students.

12. STUDENT SUPERVISING EXPERIENCE

In the past few years, I have supervised the following postgraduate and undergraduate students:

- Since October 2003, I have been supervising the postgraduate (Ph.D) student Steven Rimmer at the Centre for Particle Theory (CPT), University of Durham. Steve attended successfully the graduate courses offered at CPT, and he recently completed his first scientific paper (to be published in Physics Letters B – see List of Publications), and he is actively working on his second. His Ph.D thesis is focused on the phenomenology of the supersymmetric gauge theories.

- During the period April-September 2005, I supervised the postgraduate (M.Sci.) student Max Schmidt-Sommerfeld. After he attended the graduate courses at CPT, Max worked on his M.Sci. thesis that was focused on Neutrino Physics and Supersymmetry. His work was also part of the aforementioned publication in Physics Letters B.

- During the academic year 2004-2005, I supervised the Level 4 Project of the undergraduate student John Tully. The title of his Project was "Renormalization", and the quality of his work secured him a post-graduate student position at the Institute for Particle Physics Phenomenology (IPPP), at the University of Durham.

- In May 2005, I acted as an external examiner of the Ph.D. thesis of the postgraduate student Dara Doyle based at the Centre for Astronomy and Theoretical Physics, University of Sussex, UK.

- In summer 2004, I supervised the projects of two undergraduate students attending the 2nd "PPARC International Summer School (IUSS) for Particle Physics and Astronomy" at IPPP. The first student worked on the ionization effect of matter by a magnetic monopole, and the second on the asymptotic freedom of quarks.

- As a research associate at the University of Bonn, in Germany, I supervised the 4th-year projects of the undergraduate students Akin Wingerter and Mark Hillenbach. Both students went on to study for a Ph.D. Diploma at the University of Bonn: Mark is still a postgraduate student while Akin has recently graduated and accepted a postdoctoral position at the University of Ohio, USA.

13. RESEARCH PROPOSALS – GRANTS

As Principal Investigator, I have submitted and was successfully awarded the following research proposals/applications:

• **1998-2000:** Research proposal for a 2-year European "Marie Curie" Fellowship with title "Phenomenology of the Minimal Supersymmetric Standard Model"; the fellowship was hosted by the Rutherford Appleton Laboratory, Oxfordshire, UK.

• **2005-2007:** Application for a research grant from Nuffield Foundation, UK, as a Lecturer at the University of Durham, aiming at studying the phenomenology of elementary particles.

In addition, in 2005, I have participated as a co-investigator in a research proposal submitted to the European Union with title "Early Stage Research Training: Astroparticle Physics". The research proposal aims at securing funding for postgraduate students, and has successfully reached the second round of the selection process.

Finally, during the current academic year, I have been a member of the following two European Networks:

1. Research Training Network (RTN): "Quest for Unification"

2. EU6 Transfer of Knowledge Project : "Algotools".

14. RESEARCH REVIEW AND RESEARCH INTERESTS

As a PhD student, I started (and I continue) working on the subject of Supersymmetry. In the context of my dissertation, low energy threshold effects [1] in the MSSM with Radiative Electroweak symmetry breaking were investigated and predictions for the QCD coupling α_s from the minimal $SU(5)$ model and some extensions of it were made by including low(both logarithmic and finite)- and high-energy threshold effects in the framework of the two-loop renormalization group [2]. In addition, in the same model, I studied $b-\tau$ Yukawa unification or unification of all Yukawa couplings. Predictions for neutrino masses in the SUSY $SU(5)$ models were also made [3]. The generation of the GUT scale through radiative corrections was a subject that fascinated me at the latest stages of my PhD and was studied in the context of a R-symmetric "flipped" $SU(5) \times U(1)_X$ model [4]. I also became very interested in the predictions of low energy Z-Observables from the MSSM. An exhaustive scan of the parameter space was done [5, 6] and the full supersymmetric one-loop corrections to the effective weak mixing angle, experimentally determined in LEP and SLD experiments, were considered. Project after project, a Fortran program, now called `SUITY`, was built and that completed my PhD thesis [7].

Since I joined the theory group at Rutherford Appleton Laboratory, I started working on the R-parity violated version of the MSSM and on Higgs boson production processes at Hadron Colliders. The two loop Renormalization Group Equations for the R-parity violating couplings were completed for the first time in the literature [8]. We made predictions for (a) the gauge coupling unification, (b) the bottom-tau unification, (c) the fixed-point structure of the top quark Yukawa coupling, and (d) the two-loop bounds from perturbative unification. The complete set of the 2-loop RGE's was added to `SUITY` at that stage. Continuing in the same framework, we presented [9] an update form of the most stringent experimental bounds on the trilinear R-parity violating couplings. We, then, analysed bounds on the R-parity violating couplings at the unification scale by renormalising the weak scale bounds. A contribution to physics at RUN II at Tevatron was announced in [10]. A new mechanism for the CP-odd Higgs boson production at the LHC and for the production of all the other Higgs bosons in the MSSM was proposed in [11] and [12], respectively, again for the first time in

the literature. A small summary of the results was given in [13]. I was always interested in studying a specific Superstring Model and deriving phenomenological predictions from it. So, in [14], we examined the possible effect of the intra–family non–universality on the resulting SUSY spectrum and the values of the strong coupling, effective weak mixing angle and W-gauge boson mass, up to a two-loop accuracy, in the two models with universal and non-universal soft breaking sectors derived in the context of Heterotic Superstrings. In the year 2000, there had been a lot of discussion in the literature about the SUSY CP-violating phases. My research activities included also this topic and two articles [15, 16] were written where we studied the effect of the CP-phases on the Higgs boson production both at Tevatron and at the LHC. Large effects on the cross sections or decays of the Higgs Bosons had been indeed found. The upper limit on the CP-even Higgs boson mass in the MSSM and in the Minimal Supergravity scenario as well as constraints on $\tan\beta$ parameter from LEP data taken until the end of 1999, are analyzed in [17]. With M. Pospelov we proved [18] that in the MSSM without an axion mechanism of solving the strong CP-problem, large SUSY CP-phases are excluded since the leptonic trilinear soft breaking coupling gives large corrections to the theta QCD angle already at 1-loop. Continuing on CP-violating effects we studied the dipole moments of the electron, neutrino and neutron in the MSSM without R-parity symmetry [19]. Jumping onto the extra dimensions, we studied [20] in a simple way, the modifications of the strengths of the gravitational and gauge interactions for various values of extra dimensions, and we determined the energy scale at which the strengths of the forces are unified. In March of 2000, together with my collaborator Ben Allanach we tried to attack the slepton negative mass squared problem in the Anomaly Mediated Supersymmetry Breaking (AMSB) scenario [21]. The idea was to consider an AMSB model with broken R-parity symmetry. Easily one can solve the above problem without spoiling the RGE invariance or the flavour structure of the Model. Predictions for the mass spectrum in the upgrade Tevatron Run-II and LHC were made. Just before I join the Bonn group there were few works mentioning a natural embedding of a light ($\sim$ 5 GeV) bottom squark (sbottom) in the MSSM. By calculating the 1-loop pole mass we found [22] that this is only true when the light sbottom is accompanied with a light gluino. However, the current experimental bounds on the latter rather disfavour this hypothesis and therefore the whole hypothesis of the light sbottom in the MSSM. My last paper published from RAL had to do with the study of a new Minimal Extension of the Supersymmetric SM (nMSSM) [23]. nMSSM contains no dimensionfull parameters in the superpotential, and thus solves the μ-problem. Higgs/SUSY phenomenology at hadron colliders were also studied within this scenario.

In October 2000, I was appointed RTN "Across the energy frontier" fellow by Prof. Nilles at the University of Bonn. I decided to spent some months learning more on the phenomenology of the Higgs boson interactions [especially the experimental side] as well as on B-physics. In addition to the excellent theory group, Bonn has also a great experimental group and the discussions with them helped me a lot in achieving my goal. Certainly, the year 2000-2001 was a very interesting year after the two major "hints" for new physics : 1) the observation of an around 2σ (finally) higgs boson with a mass 115 GeV by LEP and 2) the observation of a 2σ deviation of the muon anomalous magnetic moment $(g-2)$ over the SM by BNL. Regarding the first "hint", we made [24, 25] an exhaustive analysis for

the prediction of the light Higgs boson mass in the three most prominent SUSY breaking scenarios : mSUGRA, mGMSB and mAMSB. The implications of a possible Higgs signal at 115 GeV for SUSY searches at future colliders were also discussed. Regarding the second "hint" for new physics, together with H. Haber [one of the world experts on Higgs physics] we tried to find [26] the more minimalistic model which could explain the BNL deviation from the SM on $g-2$. We found that a significant contribution could be possible from the Higgs sector in the minimal flavour Two Higgs Doublet Model (2HDM). If that is the case, the Higgs mass should be around 10 GeV with its coupling to the gauge bosons approximately zero. It was of course necessary to search all the literature since the first Higgs searches had appeared in the 80's. We found that indeed our idea was feasible and suggested [27] to the experimentalists at LEP to search for such a situation by just using their existing data. This investigation is almost ready to be published by LEP! It is also well known that the prediction for $g-2$ can be enhanced in the MSSM mainly by $\tan\beta$. Large $\tan\beta$ enhances also the bottom Yukawa coupling and obviously B-physics observables like, for example, $B_s \to \mu^+\mu^-$. A striking correlation between the muon $g-2$ and the Branching ratio of $B_s \to \mu^+\mu^-$ was found in the context of the mSUGRA scenario [28]: if BNL persists in its current value for $g-2$, then the process $B_s \to \mu^+\mu^-$ should be seen at CDF within the next few years. In the same vein, my collaborators and I studied [34], in the framework of minimal supergravity (mSUGRA) scenario, the Tevatron search potential for two observables which reveal complementary information on the mSUGRA parameter space: the "gold-plated" decays of charginos/neutralinos to trilepton final states, and the rare decay $B_s \to \mu^+\mu^-$. For this study, we performed an updated analysis of the trilepton signature which included the full set of the decay matrix elements and spin correlations in the Monte Carlo simulation. This leads to a new, more promising search reach for the Tevatron. Lepton flavour violating B-meson decays in the context of the See-saw MSSM were studied in [35]. In particular, the Higgs mediated B-decay $B_{s,d} \to \mu\tau$ (analogous to $B_s \to \mu^+\mu^-$ mentioned above, but with the leading effect coming from double penguin two-loop diagrams) is found to have the largest branching ratio ($\sim 10^{-9}$) consistent with all the experimental data. We have submitted this information to the experimentalists at LHC for further studies on their sensitivity to this channel. Furthermore, in [36], a general resummed effective Lagrangian for Higgs-mediated flavour-changing neutral-current (FCNC) interactions in the MSSM, was constructed. In our derivation we also included the possibility of explicit CP violation through the Cabibbo–Kobayashi–Maskawa mixing matrix and soft supersymmetry-breaking mass terms. New testable predictions in the large $\tan\beta$ regime of the theory for CP-conserving and CP-violating observables related to the K- and B-meson systems, such as $\Delta M_{K,B}$, ϵ_K, ϵ'/ϵ, $\mathcal{B}(B_{d,s} \to \ell^+\ell^-)$ and their associated leptonic CP asymmetries were derived.

In autumn 2001, I took part in a global effort [30] of defining (useful) benchmark scenarios for SUSY searches at Tevatron and LHC colliders, as well as for a future Linear Collider. These benchmark points address various interesting physics possibilities of different SUSY breaking scenarios and will be used in the aforementioned experiments.

Upon arrival at the Technical University of Munich, P. Slavich and my self calculated the two-loop corrections to the minimization conditions of the MSSM effective potential. The

connection of these results with the renormalization group running of the MSSM parameters from the grand unification scale down to the weak scale was made. Furthermore, a two-loop calculation of the corrections to the Higgs mixing parameter μ and to the running CP-odd Higgs mass m_A in various scenarios of gravity-mediated SUSY breaking was carried out. Just recently and as a continuation of [24], we completed the analysis for the observability (production and decay) of the lightest CP-even MSSM Higgs boson at the Tevatron, the LHC, a linear e^+e^- collider, a $\gamma\gamma$ collider and a $\mu^+\mu^-$ collider in various supersymmetry breaking scenarios [38]. Higher order two loop Yukawa corrections to the neutral Higgs boson masses and at large $\tan\beta$ were calculated in [39]. Having left Munich in July of 2003, I spent 2 months at CERN. At that time and in collaboration with Ben Allanach and Herbi Dreiner we finalized a long project on general aspects and phenomenology of the R-parity violating scenario [40]. We computed the full set of coupled one-loop renormalization group equations for the gauge couplings, the superpotential parameters and for all the soft supersymmetry breaking parameters. Specializing to mSUGRA, we used the neutrino masses to set new bounds on the R-parity violating couplings. Within this framework, we studied and classified collider signatures. At about the same time, I finished a review article on the Higgs mediated flavour changing processes [41].

On October 2003, I started my lectureship at the Institute for Particle Physics and Phenomenology (IPPP) in University of Durham. I decided to turn on to neutrino physics looking for possible connections with Supersymmetry. With my IPPP colleague S. Abel and with K. Tamvakis (visitor at IPPP at the time) presented an idea of how small Dirac or Pseudo-Dirac neutrino masses can arise naturally in Supergravity [42]. A well known scale (the GUT or the string) may originate the neutrino masses with a right size. I presented this work at Planck 2004 and SUSY 2004 [44] conferences. In March 2005, a substantial collection of contributions to a SLAC Workshop, including mine focused on the Higgs-mediated lepton flavor-violating B and τ-decays in the Seesaw MSSM, led to a 483-page report on the discovery potential of a Super B Factory [45]. The experimental community in UK has strong participation in leading international experiments such as Tevatron. I took an advantage of it in collaborating with Todd Huffman, an experimenter from Oxford University working on CDF/Tevatron. I used my theoretical knowledge on the decay $B_s \to \mu^+\mu^-$. Our work [43] is focusing on two aspects : firstly we analysed the discovery potential of the Tevatron/CDF for $B_s \to \mu^+\mu^-$ and find that Tevatron is capable of reaching a discovery, and secondly we set bounds on the heaviest Higgs boson mass in the MSSM from a possible observation of $B_s \to \mu^+\mu^-$. Recently, and in collaboration with my Ph.D. student Steven Rimmer (and during the last stages, with my M.Sci. student Maximilian Schmidt-Sommerfeld and Janusz Rosiek from Warsaw), the first of a series of papers, focused on the phenomenology of the most general Minimal Supersymmetric Standard Model, was successfully completed [46]. This paper study the scalar sector of the lepton number violating MSSM, and proposes a new way of finding the complex vacuum expectation values of the neutral Higgs and lepton scalars. Following this analysis in Ref.[47], we studied in great detail neutrino masses and mixings in the aforementioned model without resorting to particular assumptions about the SUSY breaking sector.

In summary, the keywords of my current research interests are the following : Physics Beyond the Standard Model, Supersymmetry phenomenology with or without R-parity symmetry, Renormalization Group equations, threshold and loop corrections in general, Electroweak Observables, Gauge and Yukawa coupling unification, Radiative gauge symmetry breaking, neutrino physics, extra dimensions, Higgs physics, CP violation, B-physics.

Publications

[1] A. Dedes, A.B. Lahanas and K. Tamvakis, *"Radiative electroweak symmetry breaking in the MSSM and low-energy threshold",* Phys. Rev. **D53**, 3793 (1996) [hep-ph/9504239].

[2] A. Dedes, A.B. Lahanas, J. Rizos and K. Tamvakis, *"Threshold effects and radiative electroweak symmetry breaking in SU(5) extensions of the MSSM",* Phys. Rev. **D55**, 2955 (1997) [hep-ph/9610271].

[3] A. Dedes and K. Tamvakis, *"b tau unification and neutrino masses in SU(5) extensions of the MSSM with radiative electroweak breaking",* Phys. Rev. **D56**, 1496 (1997) [hep-ph/9703374].

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