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Abstract

The DOE EPSCoR implementation grant, with the support from the State of Oklahoma and from the three universities, Oklahoma State University, University of Oklahoma and Langston University, resulted in establishing of the Oklahoma Center for High Energy Physics (OCHEP) in 2004. Currently, OCHEP continues to flourish as a vibrant hub for research in experimental and theoretical particle physics and an educational center in the State of Oklahoma.

All goals of the original proposal were successfully accomplished. These include foundation of a new experimental particle physics group at OSU, the establishment of a Tier 2 computing facility for the Large Hadron Collider (LHC) and Tevatron data analysis at OU and organization of a vital particle physics research center in Oklahoma based on resources of the three universities. OSU has hired two tenure-track faculty members with initial support from the grant funds. Now both positions are supported through OSU budget. This new HEP Experimental Group at OSU has established itself as a full member of the Fermilab D0 Collaboration and LHC ATLAS Experiment and has secured external funds from the DOE and the NSF. These funds currently support 2 graduate students, 1 postdoctoral fellow, and 1 part-time engineer. The grant initiated creation of a Tier 2 computing facility at OU as part of the Southwest Tier 2 facility, and a permanent Research Scientist was hired at OU to maintain and run the facility. Permanent support for this position has now been provided through the OU university budget. OCHEP represents a successful model of cooperation of several universities, providing the establishment of critical mass of manpower, computing and hardware resources. This led to increasing Oklahoma's impact in all areas of HEP, theory, experiment, and computation.

The Center personnel are involved in cutting edge research in experimental, theoretical, and computational aspects of High Energy Physics with the research areas ranging from the search for new phenomena at the Fermilab Tevatron and the CERN Large Hadron Collider to theoretical modeling, computer simulation, detector development and testing, and physics analysis. OCHEP faculty members participating on the D0 collaboration at the Fermilab Tevatron and on the ATLAS collaboration at the CERN LHC have made major impact on the Standard Model (SM) Higgs boson search, top quark studies, B physics studies, and measurements of Quantum Chromodynamics (QCD) phenomena. The OCHEP Grid computing facility consists of a large computer cluster which is playing a major role in data analysis and Monte Carlo productions for both the D0 and ATLAS experiments. Theoretical efforts are devoted to new ideas in Higgs bosons physics, extra dimensions, neutrino masses and oscillations, Grand Unified Theories, supersymmetric models, dark matter, and nonperturbative quantum field theory. Theory members are making major contributions to the understanding of phenomena being explored at the Tevatron and the LHC. They have proposed new models for Higgs bosons, and have suggested new signals for extra dimensions, and for the search of supersymmetric particles.

During the seven year period when OCHEP was partially funded through the DOE EPSCoR implementation grant, OCHEP members published over 500 refereed journal articles

and made over 200 invited presentations at major conferences.

The Center is also involved in education and outreach activities by offering summer research programs for high school teachers and college students, and organizing summer workshops for high school teachers, sometimes coordinating with the Quarknet programs at OSU and OU.

The details of the Center can be found in http://ochep.phy.okstate.edu.

Research accomplishments in theoretical high energy physics

During the DOE EPSCoR project period, theory members of OCHEP made significant contributions in high energy physics research. The permanent OCHEP faculty members in theory are S. Nandi, K. Babu, H. Baer, C. Kao and K. Milton. The research areas of these members spanned a broad range of cutting–edge topics, ranging from Higgs boson physics, to supersymmetry, extra dimensions, neutrino physics, and non–perturbative quantum field theory. Over 80 research papers have been published in theory over the project period. These papers involved collaborations from around the world, as well as graduate students and postdocs at the OCHEP institutions. A brief summary of research findings of the various groups obtained during the project period is given below. AThe theory group was also active in organizing weekly Talk Back TV seminars broadcast between OSU and OU involving theorists as well as experimentalists. Active discussions between members have led to collaborations between OSU and OU theorists, resulting in publications.

The research of *Nandi* and his group was focussed on proposing new ideas and models for physics beyond the standard model, which can be explored and tested at the high energy colliders, such as the Large Hadron Collider (LHC). Some highlights are briefly summarized.
Extra Dimensions: These works include unification in extra dimensions, signals for extra dimensions in high energy colliders, and a model for neutrino masses in the framework of extra dimensions. Nandi (together with his postdocs Gogoladze and Mimura) was the first one to propose the unification of gauge and Yukawa interaction in grand unified theories. Such unification is only possible in the framework of extra dimensions. Their proposed $SU(8)$ model in six dimensions unifies not only the three Standard Model (SM) gauge couplings, but also the three third family Yukawa couplings. This unification can be tested at the LHC in the near future, based on the prediction for the parameter $\tan\beta$. One classic prediction of the extra dimensions is the existence of excitations of all SM particles, the Kaluza-Klein (KK) excitations. Nandi, with his collaborators (Dicus, Macesanu, McMullen, Rujoiu) proposed several ideas and models to observe the signals arising from the productions and the subsequent decays of these KK excitations. One such proposed signals, two photons together with large missing energy, is of great interest to the experimental community, and is being explored at the LHC.
Neutrino physics: Ongoing and forthcoming experiments will attempt to measure the neutrino mass differences and their mixing angles. Nandi (with collaborators Babu and Tavartkiladze) proposed a new mechanism for the generation of small neutrino masses with new dynamics occurring near the TeV scale. This is distinct from the usual see-saw mass generation in which the new dynamics occurs near the Grand Unification scale, which is beyond the reach of any high energy collider. The model includes an weak–isospin 3/2 Higgs boson,

which has a triply charged fundamental scalar particle with mass near the TeV scale. This is the first time a triply charged fundament particle has been proposed in particle physics. The existence of this particle can be explored at the LHC from its distinctive signals.

Higgs boson physics: Higgs boson is the key ingredient in the SM needed to trigger the electroweak symmetry breaking, and is the only particle not yet observed experimentally in the SM. One of the main goals of the LHC is to discover this particle. Nandi (with his student Gabriel) proposed a new two Higgs doublet model, in which the SM Higgs may not be observable in the traditional way, but may be hidden. The main discovery mode for low mass Higgs in this model is two high transverse momentum jets plus missing energy. The experiments at LHC will be able to explore this mode.

The research of *Babu* and his group has focussed on new ideas beyond the standard model with emphasis on neutrino physics and unification. The highlights of his research during the project period are briefly summarized.

Flavor symmetry at colliders: Babu and collaborators (Mariana Frank and postdoc S. Rai) suggested a consistent model with a maximal flavor symmetry group that explains the hierarchical structure of fermion masses on the one hand, and also accounts for the anomalies in top quark forward–backward asymmetry observed by the Tevatron experiments, as well as the Wjj excess seen by the CDF collaboration. This proposal, with multiple Higgs particles in the mass range $100 - 400$ GeV, has testable consequences at the LHC. He has developed a new class of flavor symmetric models based on the dihedral group Q_6 (with J. Kubo) that predicts one of the CKM quark mixing angles, and simultaneously solves the SUSY flavor problem. These models can be tested at the Super B factories by precision measurement of the CKM angles and at the LHC via the supersymmetric spectrum. The flavor symmetry results in predictions for the neutrino mixing parameters, where these models can be further tested.

Unification and proton decay: With collaborators Pati and Tavartkiladze *Babu* has developed a new class of supersymmetric $SO(10)$ grand unified theories where somewhat precise prediction for the lifetime of the proton becomes possible. In this class of models, the lifetime for the decay $p \to e^+\pi^0$, which is mediated by super-heavy gauge bosons of $SO(10)$, gets correlated with that for the decay $p \to \overline{\nu}K^+$ mediated by super-heavy Higgs bosons. This correlation is such that if the lifetime for $p \to e^+\pi^0$ is enhanced by choice of model parameters, that for the decay $p \to \overline{\nu}K^+$ decreases. Using the current experimental limits on the two lifetimes, it became possible to show that the lifetime for each mode should be shorter than about 10^{35} yrs., which is within reach of the next generation proton decay search experiments.

New mechanism for baryogenesis: Babu has proposed, in collaboration with Mohapatra and Nasri, a new way to generate the excess of baryons over anti-baryons in the early universe. This relies on the mechanism termed "post-sphaleron baryogenesis", where a standard model singlet particle decays into baryons as well as into anti-baryons, but with slightly different rates. These decays occur when the temperature of the universe is between 200 MeV – 200 GeV, in which case the non-perturbative sphalerons of weak interaction sector play no role. A characteristic prediction of this mechanism is that colored scalars must exist with masses near the TeV scale, which are subject to discovery at the LHC. Furthermore, a new

as yet to be seen phenomenon, neutron-antineutron oscillation, is predicted to occur at a rate accessible to proposed experiments.

The research efforts of *Milton* continued to focus on non–perturbative aspects of quantum field theory. *Milton* is a world–expert in the theory of Casimir energy, on which he has written a book. The highlights of *Milton*'s research during the project period are summarized below.
Quantum vacuum energy: There has been tremendous progress in research in quantum vacuum energy, PT symmetric field theory, and magnetic monopole physics, investigated by *Milton*'s group. For example, they have resolved the temperature controversy surrounding the Casimir pressure between conducting plates. *Milton* and collaborators obtained definitive proof that the Casimir energy of a dilute dielectric cylinder is zero. They showed that quantum vacuum energy, including the divergent contributions which renormalize masses, gravitates according to the equivalence principle. We made major contributions to the formulation of Casimir energies in terms of the multiple-scattering formalism, and obtained exact results for dilute objects. These methods are continuing to be applied to calculate lateral Casimir force and torques for corrugated dielectrics, which will have application in nanotechnology. Situations where Casimir and Casimir-Polder repulsion can be achieved are being explored successfully. Finite, exact results for Casimir self-energies of triangular cylinders and tetrahedra have been found for the first time. The relation between local and global Casimir energies continues to be a focus. Difficulties with unitarity in a PT-symmetric version of quantum electrodynamics are being explored. And magnetic monopole physics is still a subject of investigation.

Baer joined the OU physics department and became an OCHEP member in September 2008. His research focusses on two major (potentially connected) topics: Supersymmetry and dark matter in the universe. *Baer* has co–written a book on supersymmetry, which has become a standard textbook for advanced graduate students.
Supersymmetry at colliders: During the project period, *Baer* has engaged in research on collider signatures for supersymmetric models for the CERN LHC pp collider. He has also worked extensively on dark matter (DM) production in the early universe. His group has proposed the theory of mixed axion/LSP (lightest SUSY particle) dark matter, which combines a SUSY solution to the hierarchy problem with the Peccei-Quinn solution to the strong CP problem. The cosmological picture of DM production in the early universe becomes much more complicated in that one must account for thermal neutralino production (as usual) but with possible neutralino decay to *axinos*. (Axino is the supersymmetric partner of the axion, an ultra–light particle that is proposes to solve the strong CP problem.) Axinos can also be produced thermally. In addition, *saxion* (the SUSY scalar partner of the axion) production takes place both thermally or via coherent oscillations. The saxion decay to LSP may boost the DM abundance, or the saxion decay to SM particles may dilute the DM abundance via late time entropy production. A unique computer code has been developed to estimate the mixed axion/LSP abundance via solving eight coupled Boltzmann equations. The associated collider signals have also been worked out.

Research accomplishments of the OCHEP experimental program.

The experimental program of the Oklahoma Center for High Energy (OCHEP) physics

has gained significantly from the EPSCOR grant. A new experimental group at Oklahoma State University was founded and the resources of three major universities were consolidated to enhance the impact of Oklahoma researchers on two major international experiments in the world, D0 at the Fermilab Tevatron, and ATLAS at LHC, CERN. OCHEP faculty members have made contributions to the Standard Model (SM) Higgs boson search, top quark studies, B physics studies, and measurements of Quantum Chromodynamics (QCD) phenomena. At this moment, OCHEP experimental groups continue to work together on many projects.

OSU has hired two tenure-track faculty members using the grant funds. Both positions are now supported through the OSU budget. One of the faculty members has already received tenure. At present, the new OSU group is externally funded through DOE and NSF for 2 graduate students, 1 postdoctoral fellow, and 1 part-time engineer. The success of the experimental program is prominent due to the coherent effort of OU, OSU and Langston groups. Experimental groups from these three universities have actively worked together on many projects. These include a search for a Higgs boson and top quark physics studies with the D0 detector; top quark physics with the ATLAS detector; b-tagging at ATLAS, and an upgrade of the ATLAS pixel detector. Our respective physics groups have video meetings to discuss computing and physics issues weekly. Combined theory/experimental seminars are presented every week.

The experimental program at OCHEP was built on the strength of faculty members from three universities. Our hardware expertise lies in the area of tracking detectors. OU and OSU personnel have significantly contributed to the D0 silicon vertex detector construction, including construction and offline tracking reconstruction. In ATLAS, OU has produced flex cables for the current pixel detector. Both OU and OSU are participating in the ATLAS pixel detector upgrade, developing and constructing the optobox that is related to the pixel detector readout. Groups have secured NSF MRI funding, and have made great progress towards a new readout chain. Our faculty, engineers and students were working on the PIN diode (used for the readout of pixel detector) radiation hardness characterization. Based on our hardware expertise, we have defined our area of interest in terms of software as b-tagging (D0, ATLAS) and tracking (D0 – track reconstruction; ATLAS – online-offline database for pixel detector calibration). OCHEP faculty have expertise in these areas and serve both experiments with a great success. They have been appointed to various leadership positions during the time period of the EPSCOR funding in tracking and b-tagging in D0 and ATLAS. Our experimental physics group has participated in top quark and bottom quark physics, searches for the Higgs boson, searches for SUSY particles and QCD physics. Faculty, students and postdocs from the different universities have successfully worked together under the umbrella of OCHEP. OCHEP members have held leadership positions in QCD, top, and Higgs physics groups at D0, and in b-tagging and top quark physics at US ATLAS. We have been especially successful in terms of the integration of our efforts in the study of top quark physics. As a result, the Oklahoma researchers from OU and OSU have became important contributors to the ATLAS top quark group, producing worldwide results that have been presented at many international conferences and published in refereed journals. A lot of interesting analyses were done under the umbrella of OCHEP from 2004 to 2010; details are

presented in the next sections. The sections are organized as follows. Section 1 represents a report of our activities at D0 experiment. Section 2 is devoted to the ATLAS experiment. Section 3 describes outreach effort of the OCHEP.

Section 1. D0 experiment.

B-physics: OU faculty B. Abbott and M. Strauss were heavily involved in the b-physics at D0 experiment for many years. They contributed to the measurement of the CP violating phase in Bs mixing. Prof. Abbott was instrumental in leading searches for new b-baryons at D0. He contributed to the discovery of the Ω_b baryon at the Tevatron, which had a big resonance in our field. Prof. Abbott led the D0 b-physics group for two years and also served on Editorial Boards which provide an independent expert's review of the analyses carried out at b-physics group. An OU graduate student, I. Hall, has defended his Ph.D. thesis under Prof. Abbott supervision. Dr. Hall is now employed in Oklahoma.

Top quark physics: OU faculty P. Gutierrez and OSU faculty F. Rizatdinova contributed significantly to top quark physics at D0. The main focus of Prof. Rizatdinova was a measurement of the top-antitop quark cross section and on a simultaneous measurement of the ratio of top quark decay to a b-quark plus W boson to the top quark decay to a quark and something else; and the top quark pair production cross section. Prof. Gutierrez with his postdoctoral fellow and graduate student have concentrated on measuring the single top quark production and on the top-antitop quark production cross section in tau+jets channel. OCHEP members have published several papers in peer reviewed journals and prepared several conference results during the EPSCoR grant period. One of the largest achievements was the discovery of single top quark production. Three of these papers were cited over 100 times each.

Higgs boson searches: OSU faculty A. Khanov, F. Rizatdinova with her graduate student H. Hegab and OU faculty P. Gutierrez were actively working on Higgs boson searches at D0. OSU faculty A. Khanov is an expert in Higgs boson physics. He led the D0 Higgs physics group for two years, performed an analysis on the WH search in the WWW channel, which contributed to the combination of all analyses which constrained the Higgs boson mass. Mr. Hegab has worked on the search for the Higgs boson in WH decay channel with the Higgs decaying to b and anti-b quarks. This is one of the most sensitive channels for low mass Higgs boson searches at the Tevatron. Mr. Hegab will soon graduate with this analysis serving as the basis for his dissertation. He presented his results at several conferences and a paper with his contribution is published in a peer-reviewed journal. Prof. Rizatdinova served and continues to serve as a head of editorial board that reviews all searches for non-standard model Higgs boson in tau+jets channel and in multijet channel. OU faculty Gutierrez has concentrated on searches for a non-SM Higgs boson, which might appear in the top quark decays instead of the W boson. This idea is widely discussed in the theoretical literature, and is waiting for experimental results. Prof. Gutierrez and his team performed an analysis that has led to a significant reduction of the phase space available for this type of the Higgs boson.

QCD Physics: The OU group has a significant amount of expertise in the study of Quantum Chromodynamics (QCD), the strong interaction between quarks and gluons. Prof. M.

Strauss has been appointed as a convener of QCD group. In this position, he directs and oversees all QCD analysis projects and publications within the D0 collaboration. In other QCD research areas B. Abbott serves as a member of an editorial board (EB) that reviews different D QCD analyses in great detail before being submitted to the collaboration for pre-publication review. OU graduate student M. Rominsky finished her Ph.D. dissertation in QCD physics under Prof. Strauss supervision and successfully defended it. M. Rominsky and M. Strauss completed a measurement of the dijet mass spectrum in six rapidity regions up to a rapidity of 2.4. This analysis, which has been published, can be used to measure parton distribution functions (PDFs), to search for undiscovered particles that decay to two jets, and to look for physics beyond the Standard Model. Currently, Dr. Rominski holds postdoctoral position at Fermi National Accelerator Laboratory.

B-tagging: OSU faculty members F. Rizatdinova and A. Khanov have actively worked on b-tagging for many years at D0. One of the b-jet identification algorithms was written and calibrated by them and applied to the first measurement of the top quark pair cross section using b-tagging technique. The b-tagging at D0 was summarized in the paper that was published in NIM journal.

Tracking: Tracking is crucial for any HEP experiment, and OCHEP personnel have made a huge impact on tracking at D0. In fact, OSU faculty A. Khanov has written a pattern recognition and reconstruction package, which is used in combination with one other package for the whole D0 data reconstruction. It is an enormous contribution to the experiment, essential to all analyses using charge particle including top quark and Higgs boson physics.

Section 2. ATLAS experiment.

Top quark physics: OU faculty P. Skubic and OSU faculty F. Rizatdinova have led the OCHEP effort in ATLAS. Based on their vast experience in D0 and taking into account the relatively small amount of data, they decided to concentrate on the top quark pair production cross section. OU faculty Skubic was appointed as a convener of the US ATLAS top quark physics working group. The ATLAS Collaboration consists of more than 3500 physicists from around the world so it has been important for the Oklahoma researchers to consolidate our resources in order to make an impact on the research program at ATLAS.

Two graduate students, Mr. D. Jana from OU under Prof. Skubic's supervision and Mr. A. Babak under Prof. Rizatdinova's supervision were heavily involved in this analysis. Our group has done the most accurate measurement of the top quark pair production cross section without b-tagging. This result is published and been presented at several international conferences by our faculties and graduate students. Both students are working on their Ph.D. theses on top quark physics.

SUSY physics: Supersymmetric models are very popular because of their ability to predict observable effects at the LHC. The OU group became a member of the ATLAS SUSY group and contributed to several papers through the estimation of the QCD background. SUSY searches at ATLAS have demonstrated a nice example of collaboration between OU theorist H. Baur and the experimental group led by OU faculty P. Skubic and B. Abbott. The experimental group has been searching for a new particle predicted by Prof. Baur and has established an upper limit on its production and mass.

B-tagging: OSU and OU faculty, Prof. Khanov, Rizatdinova and Skubic and OU postdoc Dr. M. Saleem made a significant impact on the development of the b-tagging calibration in ATLAS. New methods of determining the mistagging rate (probability to identify a light quark or gluon jet as a b-quark jet) measurement were developed by the OCHEP team. These methods are used routinely by the collaboration, providing important information for all physics analyses involving b-tagging. The ATLAS Collaboration has greatly appreciated this service task to the experiment. OSU faculty Khanov was appointed as a convener on the b-tagging subgroup on the mistagging rate calibration.
Hardware: OCHEP personnel have vast experience in the construction of tracking detectors. OU had responsibility for the design, production, assembly, and testing of the flex-hybrid circuit that provides interconnections on all pixel modules. OU faculty, graduate, and undergraduate students have completed the flex-hybrid production of 2600 circuits that have been assembled and tested in the lab at OU and used in the construction of the current pixel detector.

OU and OSU groups in collaboration with Ohio State University have started an R&D project to develop radiation-hard optical link components for the upgrade of the ATLAS pixel detector. Seven irradiation tests have been done with the test setups developed by OSU graduate student B. Abi. He presented results at two international conferences. OCHEP universities collaborated on the optobox construction for the Insertable B-Layer (IBL) that will be installed after significant radiation damage is done to the current B-layer of the pixel detector. We have obtained funding for the IBL optobox project through an NSF MRI grant that supports IBL efforts in the U.S.

Section 3. Quarknet and Outreach.

Quarknet is a program sponsored by the NSF and DOE, which partners high energy physics (HEP) professors and programs at major universities with local high school teachers. Its purpose is to help bring the excitement of particle physics research into the high school classroom and to provide teachers with professional development opportunities. Currently there are about 60 U.S. universities participating.

As soon as the OSU experimental HEP group was founded, OSU partnered with OU to conduct a combined Quarknet program. Resources from both EPSCoR and Quarknet have been used to develop combined OU/OSU workshops which include lectures and hands-on activities. Workshops were conducted either at OSU or OU with professors from both universities. We reviewed basic properties of the standard model, discussed recent measurement techniques and results, and developed and reviewed curriculum that could be used in a high school classroom. We also built, calibrated, and tested cosmic ray detectors. Each teacher was able to take their detector back to their classroom to permanently use for educational purposes. The cosmic ray detectors provide various opportunities for the students to learn about elementary particles, detection techniques.

The Quarknet and EPSCoR programs have provided excellent opportunities for over 50 high school teachers in the State of Oklahoma to learn about particle physics, develop curriculum and tools to educate their students in HEP, and develop and maintain professional teaching and research relationships with the HEP faculty at OU and OSU. We estimate that

this program has impacted over 3500 high school students throughout the state. We will continue our association with Quarknet and with high school teachers for the foreseeable future.

Faculty from the OU, OSU HEP groups have also given about 20 talks on particle physics and related topics to various civic groups throughout the state.

Publications

Publications in 2011

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3. "Discovering Colorons at the Early Stage LHC," D. A. Dicus, C. Kao, S. Nandi, J. Sayre, Phys. Rev. D83(2011)091702.

4. "Variations on the Q_6 model of flavor", K.S. Babu, K. Kawashima, and J. Kubo, Phys. Rev. **D83**, 095008 (2011).

5. "Top quark asymmetry and Wjj excess at CDF from gauged flavor symmetry," K. S. Babu, M. Frank, S. K. Rai, Phys. Rev. Lett. **107**, 061802 (2011).

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2. "Collider implications of multiple non-universal extra dimensions," R. Ghavri, C. D. McMullen and S. Nandi, Phys. Rev. D **74**, 015012 (2006) [arXiv:hep-ph/0602014].

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7. "Physics at a Fermilab proton driver," M. G. Albrow *et al.*, arXiv:hep-ex/0509019.

8. "Theory of neutrinos: A white paper," R. N. Mohapatra *et al.*, arXiv:hep-ph/0510213.

9. "SU(2) family symmetry and the supersymmetric spectrum," O. C. Anoka, K. S. Babu and I. Gogoladze, arXiv:hep-ph/0512333.

10. "Post-sphaleron baryogenesis," K. S. Babu, R. N. Mohapatra and S. Nasri, Phys. Rev. Lett. **97**, 131301 (2006) [arXiv:hep-ph/0606144].

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13. "QCD corrections to Higgs pair production in bottom quark fusion," S. Dawson, C. Kao, Y. Wang and P. Williams, arXiv:hep-ph/0610284.

14. "$B_S \to \mu^+\mu^-$ versus direct Higgs searches," C. Kao and Y. Wang, arXiv:hep-ph/0610418.

15. "Surface divergences and boundary energies in the Casimir effect," K. A. Milton, I. Cavero-Pelaez and J. Wagner, J. Phys. A **39**, 6543 (2006) [arXiv:hep-th/0510236].

16. "Green's dyadic approach of the self-stress on a dielectric-diamagnetic cylinder with non-uniform speed of light," I. Cavero-Pelaez and K. A. Milton, J. Phys. A **39**, 6225 (2006) [arXiv:hep-th/0511171].

17. "Electromagnetic radiation: Variational methods, waveguides and accelerators," K. A. Milton and J. Schwinger, Springer, Berlin, 2006.

18. "Note on a Casimir energy calculation for a purely dielectric cylinder by mode summation," A. Romeo and K. A. Milton, J. Phys. A **39**, 6703 (2006).

19. "Local Casimir Energies For A Thin Spherical Shell," I. Cavero-Pelaez, K. A. Milton and J. Wagner, Phys. Rev. D **73**, 085004 (2006).

20. "Julian Schwinger (1918-1994)," K. A. Milton, to be published in volume in honor of Ettore Majorana, ed. A. Zichichi.

21. "Local and global Casimir energies for a semitransparent cylindrical shell," I. Cavero-Pelaez, K. A. Milton and K. Kirsten, arXiv:hep-th/0607154.

22. "Julian Schwinger: Nuclear physics, the radiation laboratory, renormalized QED, source theory, and beyond," K. A. Milton, Physics in Perspective, in press.

23. "Local and global Casimir energies in a Green's function approach," K. A. Milton, I. Cavero-Pelaez and K. Kirsten, invited contribution to Proceedings of Marcel Grossmann 11.

24. "What is the Temperature Dependence of the Casimir Effect ?" J. S. Hoye, I. Brevik, J. B. Aarseth, and Milton, quant-ph/0506025 v3, J. Phys. A 39, 6031-38 (2006).

25. "PT-Symmetric Versus Hermitian Formulation of Quantum Mechanics," C. M. Bender, J.-H. Chen, and K. A. Milton, hep-th/0511229, J. Phys. A 39, 1657-1668 (2006).

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30. "Equivalence of a Complex PT-Symmetric Quartic Hamiltonian and a Hermitian Quartic Hamiltonian with an Anomaly," C. M. Bender, D. C. Brody, J.-H. Chen, H. F. Jones, K. A. Milton, and M. C. Ogilvie, hep-th/0605066, Phys. Rev. D 74, 025016 (2006).

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35. "Measurement of $B(t \to Wb)/B(t \to Wq)$ at $\sqrt{s} = 1.96$-TeV," V. M. Abazov *et al.* [D0 Collaboration], Phys. Lett. B **639**, 616 (2006) [arXiv:hep-ex/0603002].

36. "First direct two-sided bound on the B_s^0 oscillation frequency," V. M. Abazov *et al.* [D0 Collaboration], Phys. Rev. Lett. **97**, 021802 (2006) [arXiv:hep-ex/0603029].

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48. "Search for W' boson production in the top quark decay channel," V. M. Abazov *et al.* [D0 Collaboration], Phys. Lett. B **641**, 423 (2006) [arXiv:hep-ex/0607102].

49. "Limits on anomalous trilinear gauge couplings from $WW \to e^+e^-$, $WW \to e^\pm\mu^\mp$, and $WW \to \mu^+\mu^-$ events from $p\bar{p}$ collisions at $\sqrt{s}$ = 1.96-TeV," V. M. Abazov *et al.* [D0 Collaboration], Phys. Rev. D **74**, 057101 (2006) [arXiv:hep-ex/0608011].

50. "Search for pair production of scalar bottom quarks in $p\bar{p}$ collisions at $\sqrt{s}$ = 1.96-TeV," V. M. Abazov *et al.* [D0 Collaboration], Phys. Rev. Lett. **97**, 171806 (2006) [arXiv:hep-ex/0608013].

51. "First determination of the electric charge of the top quark," V. M. Abazov *et al.* [D0 Collaboration], arXiv:hep-ex/0608044.

52. "Measurement of the ratios of the $Z/\gamma^* + \geq n$ jet production cross sections to the total inclusive Z/γ^* cross section in $p\bar{p}$ collisions at $\sqrt{s}$ = 1.96-TeV," V. M. Abazov *et al.* [D0 Collaboration], arXiv:hep-ex/0608052.

53. "Measurement of B/d mixing using opposite-side flavor tagging," V. M. Abazov *et al.* [D0 Collaboration], arXiv:hep-ex/0609034.

54. "Measurement of the t anti-t production cross section in p anti-p collisions at s**(1/2) = 1.96-TeV using secondary vertex b tagging," V. M. Abazov *et al.* [D0 Collaboration], Phys. Rev. D **74**, 112004 (2006) [arXiv:hep-ex/0611002].

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1. "Hidden gauge symmetries: A new possibility at the LHC," T. j. Li and S. Nandi, Phys. Lett. B **617**, 112 (2005) [arXiv:hep-ph/0408160].

2. "Orbifold unification for the gauge and Higgs fields and their couplings," I. Gogoladze, T. j. Li, Y. Mimura and S. Nandi, Phys. Lett. B **622**, 320 (2005) [arXiv:hep-ph/0501264].

3. "Coupling unifications in gauge-Higgs unified orbifold models," I. Gogoladze, T. Li, Y. Mimura and S. Nandi, Phys. Rev. D **72**, 055006 (2005) [arXiv:hep-ph/0504082].

4. "Tying in CP and flavor violations with fermion masses and neutrino oscillations," K. S. Babu, J. C. Pati and P. Rastogi, Phys. Rev. D **71**, 015005 (2005) [arXiv:hep-ph/0410200].

5. "Dihedral families of quarks, leptons and Higgses," K. S. Babu and J. Kubo, Phys. Rev. D **71**, 056006 (2005) [arXiv:hep-ph/0411226].

6. "Probing Vectorlike Families In Essm / SO(10) Through Neutrino Counting, Higgs Mass And Nu-N Scattering," K. S. Babu and J. C. Pati, Int. J. Mod. Phys. A **20**, 6403 (2005).

7. "Split supersymmetry from anomalous U(1)," K. S. Babu, T. Enkhbat and B. Mukhopadhyaya, Nucl. Phys. B **720**, 47 (2005) [arXiv:hep-ph/0501079].

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9. "Neutrino masses and mixings in a minimal SO(10) model," K. S. Babu and C. Macesanu, Phys. Rev. D **72**, 115003 (2005) [arXiv:hep-ph/0505200].

10. "A unified framework for symmetry breaking in SO(10)," K. S. Babu, I. Gogoladze, P. Nath and R. M. Syed, Phys. Rev. D **72**, 095011 (2005) [arXiv:hep-ph/0506312].

11. "Model of geometric neutrino mixing," K. S. Babu and X. G. He, arXiv:hep-ph/0507217.

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14. "On the Temperature Dependence of the Casimir Effect," I. Brevik, J. B. Aarseth, J. S. Hoye and K. A. Milton, Phys. Rev. E **71**, 056101 (2005) [arXiv:quant-ph/0410231].

15. "Casimir energy for a dielectric cylinder," I. Cavero-Pelaez and K. A. Milton, Annals Phys. **320**, 108 (2005) [arXiv:hep-th/0412135].

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18. "Quantum mechanics using Fradkin's representation," K. V. Shajesh and K. A. Milton, arXiv:hep-th/0510103.

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37. "Production of W Z events in p anti-p collisions at s**(1/2) = 1.96-TeV and limits on anomalous W W Z couplings," V. M. Abazov *et al.* [D0 Collaboration], Phys. Rev. Lett. **95**, 141802 (2005) [arXiv:hep-ex/0504019].

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39. "Measurement of the t anti-t production cross section in p anti-p collisions at s**(1/2) = 1.96-TeV using kinematic characteristics of lepton + jets events," V. M. Abazov *et al.* [D0 Collaboration], Phys. Lett. B **626**, 45 (2005) [arXiv:hep-ex/0504043].

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42. "Measurement of the W boson helicity in top quark decays," V. M. Abazov *et al.* [D0 Collaboration], Phys. Rev. D **72**, 011104 (2005) [arXiv:hep-ex/0505031].

43. "Search for single top quark production in p anti-p collisions at s**(1/2) = 1.96-TeV," V. M. Abazov *et al.* [D0 Collaboration], Phys. Lett. B **622**, 265 (2005) [arXiv:hep-ex/0505063].

44. "Measurement of the t anti-t production cross section in p anti-p collisions at s**(1/2) = 1.96-TeV in dilepton final states," V. M. Abazov *et al.* [D0 Collaboration], Phys. Lett. B **626**, 55 (2005) [arXiv:hep-ex/0505082].

45. "Search for large extra spatial dimensions in dimuon production at D0," V. M. Abazov *et al.* [D0 Collaboration], Phys. Rev. Lett. **95**, 161602 (2005) [arXiv:hep-ex/0506063].

46. "Measurement of semileptonic branching fractions of B mesons to narrow D** states," V. M. Abazov *et al.* [D0 Collaboration], Phys. Rev. Lett. **95**, 171803 (2005) [arXiv:hep-ex/0507046].

47. "Measurement of the lifetime difference in the B/s0 system," V. M. Abazov *et al.* [D0 Collaboration], Phys. Rev. Lett. **95**, 171801 (2005) [arXiv:hep-ex/0507084].

Publications in 2004

1. "Unitarity in higher dimensions and gauge unification," R. S. Chivukula, D. A. Dicus, H. J. He and S. Nandi, arXiv:hep-ph/0402222.

2. "Model building with gauge-Yukawa unification," I. Gogoladze, Y. Mimura and S. Nandi, Phys. Rev. D **69**, 075006 (2004) [arXiv:hep-ph/0311127].

3. "6D Higgsless standard model," S. Gabriel, S. Nandi and G. Seidl, Phys. Lett. B **603**, 74 (2004) [arXiv:hep-ph/0406020].

4. "Perturbative unification and Higgs boson mass bounds," K. S. Babu, I. Gogoladze and C. Kolda, arXiv:hep-ph/0410085.

5. "Discovering the Higgs bosons of minimal supersymmetry with muons and a bottom quark," S. Dawson, D. Dicus, C. Kao and R. Malhotra, Phys. Rev. Lett. **92**, 241801 (2004) [arXiv:hep-ph/0402172].

6. "Neutralino relic density in a supersymmetric U(1)' model," V. Barger, C. Kao, P. Langacker and H. S. Lee, Phys. Lett. B **600**, 104 (2004) [arXiv:hep-ph/0408120].

7. "Search for doubly-charged Higgs boson pair production in the decay to $\mu^+\mu^+\mu^-\mu^-$ in $p\bar{p}$ collisions at $\sqrt{s} = 1.96$ TeV," V. M. Abazov *et al.* [D0 Collaboration], Phys. Rev. Lett. **93**, 141801 (2004) [arXiv:hep-ex/0404015].

8. "Observation and properties of the $X(3872)$ decaying to $J/\psi\pi^+\pi^-$ in $p\bar{p}$ collisions at $\sqrt{s} = 1.96$ TeV," V. M. Abazov *et al.* [D0 Collaboration], Phys. Rev. Lett. **93**, 162002 (2004) [arXiv:hep-ex/0405004].

Conference and Workshop Talks

Conference and Workshop Talks in 2011

1. "Charged lepton flvoar violation," K. S. Babu, invited overview talk at the Intensity Frontier Workshop, Rockville, MD, December 2011.

2. "Upper limit on proton lifetime in minimally realistic SUSY SU(5)," K. S. Babu, invited talk at the Intensity Frontier Workshop, Rockville, MD, December 2011.

3. "Grand unification and θ_{13}," K. S. Babu, invited talk at the CETUP Workshop, Center for Theoretical Physics and Related Areas, Lead, South Dakota, June 2011.

4. "Baryogenesis and neutron–antineutron oscillations," K. S. Babu, invited talk at the mini-workshop on neutron–antineutron oscillations, Washington University, St. Louis, February 2011.

5. "PT-Symmetric Quantum Electrodynamics and Unitarity", K. A. Milton, Workshop on PT Quantum Mechanics, Heidelberg, September 27, 2011.

6. "Repulsive Casimir Effects", K. A. Milton, Plenary talk at Quantum Field Theory Under the Influence of External Conditions, QFEXT11, Benasque, Spain, September 20, 2011.

7. "PT-Symmetric Quantum Electrodynamics – PTQED", K. A. Milton, seminar at Nuclear Physics Institute, Prague, July 27, 2011.

8. "Thermal Issues in Casimir Forces Between Conductors and Semiconductors", K. A. Milton, Invited talk at Frontiers of Quantum and Mesoscopic Thermodynamics, Prague, July 25, 2011.

9. "Repulsive Casimir Effects", K. A. Milton, talk at Quantum Vacuum Meeting, OU, May 18, 2011

10. "Casimir Energies and Forces: An Accelerating Subject", K. A. Milton, Colloquium given at the Department of Physics, Norwegian University of Science and Technology, Trondheim, January 28, 2011.

11. "The Thermal Casimir Effect", K. A. Milton, Casimir Effect Workshop, Trondheim, Norway, January 26, 2011.

12. "$B_s \to J/\psi\ \phi$", B. Abbott, FPCP 2011, Kibbutz Maale Hachamisha, Israel, May 23-27, 2011.

13. "Lustre Storage Configuration at the OU Southwest Tier2 Cluster", H. Severini, Invited Talk at the ATLAS Technical Interchange Meeting, JINR, Dubna, Russia, June 2, 2011.

14. "The DZero Virtual Organization", J. Snow, Open Science Grid All Hands Meeting, Boston, Massachusetts, March 9, 2011.

Conference and Workshop talks in 2010

1. "Fermion mass hierarchy and new physics at the TeV scale," S. Nandi, invited talk presented at the International Conference on High Energy Physics, ICHEP 2010, Paris, France, July 22 - 28, 2010.

2. "New mechanism for neutrino mass generation and triply charged Higgs boson at the LHC," S. Nandi, invited talk presented at the International Conference on High Energy Physics, ICHEP 2010, Paris, France, July 22 - 28, 2010.

3. "Quark lepton unification in higher dimensions," S. Nandi, invited talk presented at the Topical conference on elementary particles, astrophysics and cosmology, Miami 2010, at Fort Lauderdale, Florida, December 14 - 19, 2010.

4. "SU(9) family unification," S. Nandi, talk presented at Phenomenology 2010 Symposium, at Madison, Wisconsin, May 10 - 12, 2010, also chaired a session.

5. "Predictive theories of neutrino mixing," K. S. Babu, invited talk at the 2010 Workshop on major DUSEL physics topics, South Dakota School of Mines & Technology, Rapid City, SD, October 2010.

6. "Recent progress in SUSY GUTs," K. S. Babu, invited talk presented at the 35th International Conference in High Energy Physics, ICHEP 2010, Paris, July 2010.

7. "Radiative generation of neutrino masses and its experimental signals," K. S. Babu, invited talk presented at the 35th International Conference in High Energy Physics, ICHEP 2010, Paris, July 2010.

8. "Radiative neutrino mass generation and experimental signals," K. S. Babu, invited talk presented at GoranFest, the Joy of Making Physics, Split, Croatia, June 2010.

9. "Radiative neutrino mass generation and its experimental signals," K. S. Babu, invited talk presented at the Santa Fe – Los Alamos Workshop in particle physics, July 2010.

10. "Family symmetries for fermion masses and mixings and SUSY flavor," K. S. Babu, talk presented at the PHENO 2010 Symposium, Madison, WI, May 2010.

11. "The fermion mass puzzle and physics beyond the standard model," K. S. Babu, invited plenary talk at the XI Workshop on High Energy Physics Phenomenology, WHEPP XI, Ahmedabad, India, January 2010.

12. "Resonant leptogenesis," K. S. Babu, invited talk at the XI Workshop on High Energy Physics Phenomenology, WHEPP XI, Ahmedabad, India, January 2010.

13. "Julian Schwinger's Contribution to Education and His Legacy", K. A. Milton, Joint APS/AAPT meeting, February 15, 2010.

14. "Multiple Scattering: Dispersion, Temperature Dependence, and Annular Pistons", K. A. Milton, Workshop on Cosmology, the Quantum Vacuum, and Zeta Functions (Elizalde Fest) Barcelona, March 8, 2010.

15. "Quantum Vacuum Forces: Multiple Scattering, Dispersion, Temperature, and Self-Energies", K. A. Milton, Nonperturbative Quantum Field Theory, University of Oklahoma, April 9, 2010.

16. "PT-Symmetric Quantum Electrodynamics – PTQED", K. A. Milton, Workshop on Pseudo-Hermitian Hamiltonians in Quantum Physics, Hangzhou, China, June 21, 2010.

17. "Casimir Self-Energies Revisited – Old and New Results", K. A. Milton, Quantum Vacuum Meeting, Texas A&M University, July 9, 2010.

18. "The Casimir Effect – How Julian Schwinger's Legacy Has Grown", K. A. Milton, Workshop on Spontaneous Energy Focusing Phenomena and Multiscale Physics, The Institute of Advanced Studies, Nanyang Technological University, Singapore, September 3, 2010.

19. "$t\bar{t}$ Cross Section Measurement in μ+Jets Channel at ATLAS Using Kinematic Information", D. Jana, APS April Meeting Feb 2010, Washington, DC.

20. "Top physics in ATLAS", A. Marzin, LHC Days in Split, Split, Croatia 4-9 Oct 2010.

21. "Top Observation Status at Atlas" (Invited talk), M. Saleem, US ATLAS Physics and Performance, Brookhaven National Laboratory(BNL), New York, USA Oct 05, 2010.

22. "Top cross-section measurements with early ATLAS data", M. Saleem, 3rd InternationalWorkshop on Top Quark Physics - Top2010, Brouge, Belgium May 31- June 04, 2010.

23. "Mistag Rate measurements on Atlas Data" (Invited Talk), M. Saleem, Flavour Tagging Workshop Freiburg , Germany Oct 13 - 15, 2010.

24. "Review of charged Higgs searches at the Tevatron," P. Gutierrez, Prospects for Charged Higgs Discovery at Colliders, Uppsala University, Sweden 27-30, September 2010.

25. "Recent QCD Measurements at the Tevatron," M. Strauss, Rencontres de Blois, Blois, France 15-22, July 2010.

26. "Summary of Top Forum Workshop," P. Skubic, US ATLAS Physics and Performance Jamboree Brookhaven National Laboratory, Upton, NY, USA February 10, 2010.

27. "Top Physics WG Status," P. Skubic, Analysis Jamboree University of Texas at Arlington, Arlington, TX, USA May 17-19, 2010.

28. "Summary of the SUSY with b-jets Work," P. Skubic, SUSY Jamboree Brookhaven National Laboratory, Upton, NY, USA January 11-14, 2011.

29. "Wrap-up and Discussion of Goals and Action Items," P. Skubic, DOSAR IX Workshop The University of Johannesburg, Johannesburg, South Africa April 8, 2010.

30. "OSG : Status and Future from the perspective of D0/DOSAR," B. Abbott, Invited Talk at the DOSAR IX Workshop, The University of Johannesburg, Johannesburg, South Africa April 7, 2010.

31. "Employing Open Science Grid to support National Grid Initiatives in South America and South Africa", H. Severini, Invited Poster Presentation at Supercomputing 2010, New Orleans, LA, November 15-18, 2010.

32. "Employing Open Science Grid to support National Grid Initiatives in South America and South Africa", H. Severini, Invited Poster Presentation at CHEP 2010, Academia Sinica, Taipei, Taiwan, October 18-22, 2010.

33. "Employing Open Science Grid to support National Grid Initiatives in South America and South Africa", H. Severini, Invited Poster Presentation at the OU Supercomputing Symposium 2010, The University of Oklahoma, Norman, OK, October 5, 2010.

34. "BeStMan Storage Configuration at OU SWT2", H. Severini, Invited Talk at the OSG Storage Forum, University of Chicago, Chicago, IL, September 22, 2010.

35. "The State of DOSAR", H. Severini, Invited Talk at the DOSAR IX Workshop, The University of Johannesburg, Johannesburg, South Africa, April 6, 2010.

36. "Open Science Grid Use By DZero", J. Snow, Open Science Grid Workshop, Sao Paulo, Brazil, December 10, 2010.

Conference and Workshop talk in 2009

1. "New mechanism for neutrino mass generation," S. Nandi, invited plenary talk presented at Topical Conference on Elementary Particles, Astrophysics and Cosmology, Fourt Lauderdale, Florida, December 15 - 20, 2009.

2. Fermion mass hierarchy and new physics at the TeV scale," S. Nandi, invited plenary talk presented at 17th International Conference on Supersymmetry and Unification of Fundamental interactions, Boston, MA, June 5 - 10, 2009.

3. "New mechanism for neutrino mass generation," S. Nandi, invited talk presented at XXXIII International Conference in Theoretical Physics, Matter to the Deepest: Recent Developments in Physics of Fundamental Interactions, USTRON 09, Ustron, Poland, September 11- 16, 2009.

4. "New mechanism for neutrino mass generation," S. Nandi, talk presented at SM and BSM Physics at the LHC, CERN, Geneva, Switzerland, August 3-28, 2009.

5. "New mechanism for neutrino mass generation," S. Nandi, talk presented at PHENO 2009 Symposium : LHC Alive!, University of Wisconsin, Madison, May 11-13, 2009.

6. "Fermion mass Hierarchy and new physics at the TeV scale," S. Nandi, invited plenary talk presented at 2009 BSM LHC Workshop at the Indian Association for the Cultivation of Science, Kolkata, India, january 14 - 16, 2009.

7. "Grand Unification, nucleon decay and the flavor puzzle," K. S. Babu, invited talk at the 2nd PROMETEO Workshop, Valencia, Spain, December 2009.

8. "Weak scale baryogenesis and neutron–antineutron oscillations," K. S. Babu, invited talk presented at the Workshop on baryon and lepton number violation, Madison, WI, September 2009.

9. "New mechanisms for neutrino mass generation and their implications for LHC," K. S. Babu, invited plenary talk at the Summer Institute in Phenomenology, Fujiyoshida, Japan, August 2009.

10. "Recent progress in SUSY GUTs," K. S. Babu, invited Plenary talk at the International Workshop on Supersymmetry and Unification (SUSY09), Boston, July 2009.

11. "Left–right symmetry and its implications for LHC," K. S. Babu, talk presented at the PHENO 09 Symposium, Madison, WI, May 2009.

12. "Multiple Scattering Casimir Force Calculations: Layered and Corrugated Materials, Wedges, and CP Forces", K. A. Milton, New Frontiers in Casimir Force Control, Santa Fe, September 29, 2009.

    "Exact Multiple Scattering Results: Applications of Quantum Vacuum Forces",

13. "Iver Brevik and the Quantum Vacuum", K. A. Milton, Meeting in Honor of Iver Brevik, Norwegian University of Science and Technology, May 8, 2009.

14. "The Casimir Effect for Electromagnetic and Semitransparent Wedges: Breaking Cylindrical Symmetry", K. A. Milton, Quantum Vacuum Meeting, Texas A&M University, June 25, 2009.

15. "Discovering new particles at hadron colliders", B. Abbott, Wichita State, April 22, 2009.

16. "Measurement of the Double Differential Dijet Mass Cross Section at the Tevatron", M. Rominsky, XVII International Workshop on Deep-Inelastic Scattering and Related Subjects, Madrid, Spain, April 26 - 30, 2009.

17. "Measurements of $t\bar{t}$ Cross-section at 10TeV c.o.m energy using single lepton decay channel(s) At the Atlas Experiment", M. Saleem, BNL Analysis jamboree, Brookhaven National Laboratory(BNL), New York, USA, June 15 - 19, 2009.

18. "Top Working Group PUB Notes," P. Skubic, BNL Analysis jamboree, Brookhaven National Laboratory(BNL), New York, USA, June 15-18, 2009.

19. "Results on $B_d \to J/\psi\ K_0^*$ and $B_s \to J/\psi\ \phi$ Decay Parameters", P. Gutierrez, The 2009 Europhysics Conference on High Energy Physics, Krakow Poland, July 16-22, 2009.

20. "Prospects for measuring Top Pair Production using a likelihood method at ATLAS in 10 TeV p-p Collisions", D. Jana, DPF 2009, Detroit, Michigan, July 25-31, 2009.

21. "Prospects for measuring Top Pair Production using a like- lihood method at ATLAS in 10 TeV p-p Collisions", D. Jana, Physics for Americas, New York University, New York, New York University, Aug 2-5, 2009.

22. "Measurements of b-tagging Fake Rates in Atlas Data" (Poster Presentation), M. Saleem, USAtlas meeting of Americans, New York University, New York, USA, Aug. 03 - 05, 2009.

23. "OSG and GridUNESP", H. Severini, Invited Talk at the GridUNESP Workshop, Sao Paulo, Brazil, December 16, 2009.

24. "BeStMan-Gateway Experiences at OU", H. Severini, Invited Talk at the OSG Site Administrators Workshop, IUPUI, Indianapolis, IN, August 7, 2009.

25. "BeStMan-Gateway Experiences at OU", H. Severini, Invited Talk at the OSG Storage Forum, Fermilab, Batavia, IL, June 30, 2009.

26. "ATLAS Tier 3 Activities at OU", H. Severini, Invited Talk at the US ATLAS Tier3 Meeting, Argonne National Lab, May 18, 2009.

27. "DZero Monte Carlo Data Handling On OSG", J. Snow, Open Science Grid All Hands Meeting, Baton Rouge, Louisiana, March 3, 2009.

28. "Distributed Monte Carlo Production For DZero", J. Snow, Computing in High Energy and Nuclear Physics Conference, Prague, Czech Republic, March 21 - 27, 2009.

Conference and Workshop talks in 2008

1. "A New Two Higgs Doublet Model," S. Nandi, invited plenary talk presented at MIAMI 2008: A Topical Conference on Elementary Particles, Astrophysics and Cosmology, Fourt Lauderdale, Florida, December 16-21, 2008.

2. "New Signals of a Chromophobic Charged Higgs at the LHC" and "A New Extension of MSSM: FMSSM," S. Nandi, two invited talks presented at International Conference on High Energy Physics, ICHEP 08, Philadelphia, USA, July 29 - August 5, 2008.

3. "Collider implications of non-universal Higgs," S. Nandi, talk presented at 2008 Phenomenology Symposium: LHC Turns On, Madison, Wisconsin, April 28 - 30, 2008.

4. " Nucleon decay summary," K. S. Babu, invited summary talk at the Workshop on Underground Detectors Investigating Grand Unification, Brookhaven National Lab, October 2008.

5. " Four dimensional GUTs and their experimental signatures," K. S. Babu, invited talk at the Workshop on Stringy Reflections on LHC, Clay Mathematics Institute & Harvard University, Cambridge, MA, October 2008.

6. " Grand unified theories and their implications for neutrinos," K. S. Babu, Invited talk at ICHEP 2008, Philadelphia, July 2008.

7. " Solving the strong CP and SUSY CP problems with parity symmetry," K. S. Babu, Invited talk at the Workshop on the origins of P, CP and T violations, ICTP, Trieste, Italy, July 2008.

8. " Lectures on flavor physics," K. S. Babu, Set of four invited lectures at TASI 08, Theoretical Advanced Study Institute, University of Colorado, Boulder, June 2008.

9. " Origin of matter and $N - \overline{N}$ oscillation," K. S. Babu, invited talk at the DUSEL Theory Workshop, Ohio State University, Columbus, April 2008.

10. "Family symmetry with $SO(10)$," K. S. Babu, talk at Pheno 2008, Madison, Wisconsin, April 28-30, 2008.

11. " Standard model flavor structure, CP violation, quark mixing and connection with the LHC," K. S. Babu, set of four invited lectures at TASI 08, Theoretical Advanced Study Institute, University of Colorado, Boulder, June 2008.

12. " Solving the strong CP and SUSY CP problems with parity symmetry," K. S. Babu, invited talk at the Workshop on the origins of P, CP and T violations, ICTP, Trieste, Italy, July 2008.

13. " Grand unified theories and their implications for neutrinos," K. S. Babu, invited talk at ICHEP 2008, Philadelphia, July 2008.

14. " Nucleon decay Theory," K. S. Babu, invited review talk at NNN08, Workshop on Next generation nucleon decay and neutrino detectors, Paris, September 2008.

15. " Four dimensional GUTs and their experimental signatures," K. S. Babu, invited talk at the Workshop on Stringy Reflections on LHC, Clay Mathematics Institute & Harvard University, Cambridge, MA, October 2008.

16. " Nucleon decay summary," K. S. Babu, invited summary talk at the Workshop on Underground Detectors Investigating Grand Unification, Brookhaven National Lab, October 2008.

17. "Coulomb Resummation and Monopole Masees", K. A. Milton, International Seminar on Contemporary Problems of Elementary Particle Physics, Dedicated to the Memory of I. L. Solovstov, JINR, Dubna, Russia, January 2008.

18. "Multiple-Scattering Methods in Casimir Calculations", K. A. Milton, Quantum Vacuum meeting, OU, March 2008.

19. "Recent Developments in the Casimir Effect", K. A. Milton, 60 Years of the Casimir Effect, Brasilia, June 23 - 27, 2008.

20. "How Does Quantum Vacuum Energy Accelerate?" – K. A. Milton, ICHEP08, Philadelphia, July 29 - August 5, 2008.

21. "Exact Multiple Scattering Results – Weak-Coupling Forces Between Bodies", K. A. Milton, Quantum Vacuum meeting, TAMU, August, 2008.

22. "Evidence for Single Top Production at the Tevatron", S. Jain (on behalf of CDF and D0 collaborations), Rencontres de Moriond QCD, La Thuile, Italy, March 11, 2008.

23. "Top/SUSY Group Status", P. Skubic, FDR-1 Analysis Jamboree at BNL and ANL, March 17-20, 2008.

24. "$t\bar{t}$ Cross-section study using the lepton + jet channel with FDR data in Atlas", M. Saleem, Southwest Tier 2 Analysis Workshop III, University of Texas, Arlington, TX, USA, March 28 - 29, 2008.

25. "Mis-tag Rate Measurement on Data", M. Saleem, Atlas b-tagging Workshop 2008, Istituto Nazionale di Fisica Nucleare(INFN), Genova, Italy, May 05 - 07, 2007.

26. "Recent B physics at D0", B. Abbott, Second Workshop on Theory, Phenomenology and Ex- periments in Heavy Flavour Physics", Capri, Italy, June 16 - 18, 2008.

27. "Top quark properties at ATLAS", D. Jana (Poster on behalf of the ATLAS collaboration), ICHEP08, Philadelphia, July 29 - August 5, 2008.

28. "$t\bar{t}$ Cross-section study using the lepton + jet channel", M. Saleem, US-Atlas BNL-ANL-LBNL Jamboree, NY, USA, and also NSA top Mini-work shop at BNL NY, USA, September 09 - 12, 2008.

29. "Charged Higgs searches with D0", P. Gutierrez, Charged Higgs 2008 "Prospects for Charged Higgs Discovery at Colliders," Uppsala University, Sweden, September 16 - 19, 2008.

30. "Mistag Rate Measurements for b-tagging using Negative Tags for Atlas Experiment", M. Saleem, Invited Seminar given at the Stanford Linear Accelerator Center (SLAC), Stanford University, USA, November 12, 2008.

31. "b-tagging Algorithms and there performance at the Atlas Experiment", M. Saleem, Signaling the Arrival of the LHC, International center for Theoretical Physics (ICTP), Trieste, Italy, December 8 - 13, 2008.

32. "ATLAS Top Group Sub-structure and Plans for Early Data", P. Skubic, BNL Analysis Jamboree, December 15 - 18, 2008.

33. "Overview of FDR-1 Jamboree at BNL and ANL", P. Skubic, FDR Users Meeting, April 1, 2008.

34. "Introduction", P. Skubic, Top Mini-Workshop ANL/BNL Jamboree for readiness exercise, September 10, 2008.

35. "Introduction to the Open Science Grid", H. Severini, Invited Talk at the Second Brazilian LHC Computing Workshop, UNESP, Sao Paulo, Brazil, December 8 - 12, 2008.

36. "Installing Condor and the OSG Client", H. Severini, Invited Talk at the Second Brazilian LHC Computing Workshop, UNESP, Sao Paulo, Brazil, December 8 - 12, 2008.

37. "Overview over the ATLAS Grid Software, Panda", H. Severini, Invited Talk at the Second Brazilian LHC Computing Workshop, UNESP, Sao Paulo, Brazil, December 8 - 12, 2008.

38. "Implementing Linux-Enabled Condor in Windows Computer Labs", H. Severini, Invited Poster Presentation at the 2008 Nuclear Science Symposium, Dresden, Germany, October 19-25, 2008.

39. "Implementing Linux-Enabled Condor in Windows Computer Labs", H. Severini, Invited Talk at the OU Supercomputing Symposium 2008, The University of Oklahoma, Norman, OK, October 7, 2008.

40. "Implementing Linux-Enabled Condor in Windows Computer Labs", H. Severini, Invited Talk at the DOSAR VI Workshop, The University of Mississippi, Oxford, MS, April 18, 2008.

41. "Implementing Linux-Enabled Condor in Windows Computer Labs", H. Severini, Invited Talk at the HiPCAT Face to Face Meeting 2008, The University of Texas, Arlington, TX, February 29, 2008.

Conference and Workshop talks in 2007

1. "A New Extension of the Standard Model," S. Nandi, invited talk presented at SUSY 2007: Conference on Supersymmetry and the Unification of Fundamental Interactions, karlsruhe, Germany, July 26- August 2, 2007.

2. "Collider implications of non-universal Higgs," S. Nandi, talk presented at 2007 Phenomenology Symposium: Prelude to LHC, Madison, Wisconsin, May 7 - 9, 2007.

3. " Family Symmetry from $SO(10)$," K. S. Babu, invited plenary talk at the Workshop on Grand Unification and Proton Decay ICTP, Trieste, Italy, July 22–26, 2007.

4. " Proton decay and related topics," K. S. Babu, invited overview talk at the ICRR/CRC Future Plan Symposium, University of Tokyo, August 28–29, 2007.

5. " Post–sphaleron baryogenesis," K. S. Babu, invited talk at the International Workshop on Search for Baryon and Lepton Number Violations, Berkeley, September 20–22, 2007.

6. " Unified TeV scale picture for baryogenesis and dark matter," K. S. Babu, invited talk at the Workshop on Baryogenesis confronts experiment, University of Chicago, Nov. 7–9, 2007.

7. " Proton decay in SO(10) with stabilized doublet-triplet splitting," K. S. Babu, invited plenary talk at the International Workshop on Grand Unified Theories: Current Status and Future Prospects, Ritsumeikan University, Japan, Dec. 17-19, 2007.

8. "How Does Casimir Energy Fall?" – K. A. Milton, Midwest Theory Conference, University of Kansas, April 21, 2007.

9. "Thermal Effects in Casimir Forces", K. A. Milton, Thermal Radiation at the Nanoscale: Forces, Heat Transfer, and Coherence, Les Houches, France, May 21 - 24, 2007.

10. "PT-Symmetric Quantum Electrodynamics", K. A. Milton, Sixth Workshop on Pseudo-Hermitian Hamiltonians in Quantum Physics, City University, London, July 16 - 18, 2007.

11. "Multiple Scattering Methods in Casimir Interactions", K. A. Milton, Quantum Vacuum Energy Meeting, Texas A&M University, August 6 - 8, 2007.

12. "How Does Casimir Energy Fall?" – K. A. Milton, Eighth Workshop on Quantum Field Theory Under the Influence of External, Conditions, QFEXT07, Leipzig, Germany, September 17 - 21, 2007.

13. "B physics from the Tevatron," Aspen Winter Conference "New Physics at the Electroweak Scale and New Signals at Hadron Colliders," P. Gutierrez, January 8 - 13, 2007.

14. "B-Tagging Performance studies on 900 GeV run from At- las", M. Saleem, B-tagging workshop, Marseille, France May 10 - 11, 2007.

15. "First Observation of a New b-baryon Ω_b at D0", B. Abbott, Brown Bag Seminar, SLAC, August 14, 2007.

16. "B-tagging study for Early Run At Atlas (Poster Presen- tation)", M. Saleem, First ATLAS Physics Workshop of the Americas, SLAC, California, USA, August 20 - 23, 2007.

17. "DOSAR", P. Skubic, OSG Consortium All Hands Meeting, UC-San Diego, San Diego, CA, March 5-8, 2007.

18. "DOSAR: State of the Organization", P. Skubic, DOSAR Workshop, ISU, Ames, IA, April 5-6, 2007.

19. "Report from D0 on OSG", B. Abbott, OSG council meeting, Oakland, CA, Aug 20, 2007.

20. "Implementing Linux-Enabled Condor in Windows Computer Labs", H. Severini, Invited Talk at the OU Supercomputing Symposium 2007, The University of Oklahoma, Norman, OK, October 3, 2007.

21. "CoLinux Condor Research and Development", H. Severini, Invited Talk at the DOSAR V Workshop, Louisiana Tech University, Ruston, LA, September 27 - 28, 2007.

Conference and Workshop talks in 2006

(a) "New signals of extra dimensions and Higgs at the LHC," S. Nandi, invited plenary talk presented at Topical Meeting on the Physics at the LHC, Harish-Chandra Research Institute, Allahabad, India, December 19 - 21, 2006.

(b) "Collider implications of extra dimensions," S. Nandi, invited talk persented at ICHEP 2006: International Conference on High Energy Physics, Moscow, Russia, July 26 - August 2, 2006.

(c) "A new model for neutrino and charged lepton masses," S. Nandi, invited talk persented at ICHEP 2006: International Conference on High Energy Physics, Moscow, Russia, July 26 - August 2, 2006.

(d) "A new model for neutrino and charged lepton masses in extra dimensions," S. Nandi, invited talk persented at SUSY 2007: Conference on Supersymmetry and the Unification of Fundamental Interactions, Karlsruhe, Germany, July 26 - August 2, 2007.

(e) "Collider Implications of Extra Dimensions" and "A New Model for neutrino and Charged Lepton Masses in Extra Dimensions," S. Nandi, two invited Talks presented at ICHEP'06: 33rd International Conference on High Energy Physics, Moscow, Russia, July 26 - August 2, 2006.

(f) "New Signals of Extra Dimensions and Higgs at the LHC," S. Nandi, invited talk persented at Topical Meeting on the Physics at the LHC, Allahabad, India, December 16 - 21, 2006.

(g) "A New Model for Neutrino and Charged Lepton Masses in Extra Dimensions," S. Nandi, invited talk persented at SUSY 06 : 14th International Conference on Supersymmetry and the Unification of Fundamental Interactions, Irvine, CA, June 12 - 17, 2006.

(h) "A New Model for neutrino and Charged Lepton Masses in Extra Dimensions," S. Nandi, talk persented at PHENO 06 Symposium: Madison, WI, May 15 - 17, 2006.

(i) "Review of Nucleon decay theory", K.S. Babu, invited Plenary talk at the NNN06 Workshop, Seattle, October (2006).

(j) "Supersymmetric Models", K.S. Babu, A set of five lectures presented at the TASI 06 Workshop, Boulder, CO, July (2006).

(k) "Unification with TeV Scale lepton number violation", K.S. Babu, Talk presented at the SUSY06 Symposium, Newport Beach, CA, June (2006).

(l) "Testing violations of baryon and lepton numbers", K.S. Babu, invited Plenary Talk at WHEPP-9, Bhubaneswar, India, January (2006).

(m) "Detecting Higgs Bosons with Muons at Hadron Colliders", C. Kao, University of Hawaii, Honolulu, Hawaii, March 14, 2006.

(n) "The Top at Ten", M. Strauss, The University of Hawaii, March 16, 2006.

(o) "B_s mixing at D0", B. Abbott, Caltech, Pasadena, CA, April 11, 2006.

(p) "$B_s \to \mu\mu$ versus Direct Higgs Searches at Hadron Colliders", C. Kao, Stanford Linear Accelerator Center, Menlo Park, California, September 20, 2006.

(q) "D0 MC and Data Processing on the Grid", B. Abbott, D0SAR meeting, Norman, OK, September 21, 2006.

Conference and Workshop talks in 2005

(a) "Unification of Gauge and Higgs Couplings with Extra Dimensions," S. Nandi, invited talk presented at MIAMI 2005 : A Topical Conference in Elementary Particle Physics and Cosmology, Coral Gable and Key Biscayne, Florida, December 14 - 18, 2005.

(b) "Unification with Extra Dimensions," S. Nandi, invited talk presented at PLANCK 05: From the Planck Scale to the Electroweak Scale, ICTP, Trieste, Italy, May 23 - 28, 2005.

(c) "Hidden Gauge Symmetries: A new possibility at the LHC and the ILC," S. Nandi, invited talk presented at LCWS 05: 2005 International Linear Collider Workshop, Stanford, CA, March 18 - 22, 2005.

(d) "Hidden Gauge Symmetries: A new possibility at the LHC," S. Nandi, talk presented at PHENO 05: World Year of Phenomenology, Madison, WI, May 2 - 4, 2005.

(e) "Neutrino masses and leptogenesis in a minimal $SO(10)$ unified model", K.S. Babu, invited Plenary talk at the PLANCK Symposium, Trieste, Italy, May (2005).

(f) "Neutrino masses and leptogenesis in minimal unified $SO(10)$ model", K.S. Babu, invited talk at the PPP6 Workshop, Lo-Tung, I-Lan, Taiwan, June (2005).

(g) "Dihedral families of quarks, leptons and Higgs bosons", K.S. Babu, invited talk at the Summer Institute on Strings, Particles and Fields, National Taiwan University, Taipei, June (2005).

(h) "Neutrino masses and the quest for unification", K.S. Babu, invited talk at the Summer Institute on Strings, Particles and Fields, National Taiwan University, Taipei, June (2005).

(i) "Dihedral families of quarks, leptons and Higgs bosons", K.S. Babu, Talk at Pheno 05, Madison, WI, May (2005).

(j) "B physics at the Tevatron", B. Abbott, SLAC, Stanford, California, April 19, 2005.

(k) "Topics in Higgs search at the LHC", C. Kao, Taipei Summer Institute, National Taiwan University, Taipei, Taiwan, June 10, 2005.

(l) "Surface Divergences and Boundary Energies in the Casimir Effect", K. A. Milton, Theory Seminar, Washington University, September 15, 2005.

(m) "The Higgs Searches with Cosmic Connections (Colloquium)", C. Kao, Southern Methodist University, Dallas, Texas, October 03, 2005.

(n) "Collider Searches for Higgs Bosons with Cosmic Connections", C. Kao, Academia Sinica, Taipei, Taiwan, ROC, December 28, 2005.

Seminars and colloquia in 2004

(a) "Collider signals of Extra Dimensions," S. Nandi, invited talk presented at TEV4LHC Workshop, Fermilab, Batavia, IL, September 16 - 18, 2004.

(b) "Unification of Gauge, Higgs And Matter in Extra Dimensions," S. Nandi, invited talk presented at Miami 2004 Conference: Celebrating 40 years of quarks, Cosmology, CP-Violation, Miami, FL, Dec 15 - 19, 2004.

(c) "Unification of Gauge, Higgs And Matter in Extra Dimensions," S. Nandi, invited plenary talk presented at Internal symposium in Particles, Astrophysics and Cosmology, PASCOS04, in Boston, MA, Aug 16 - 22, 2004.

(d) "Unification of Gauge, Higgs And Matter in Extra Dimensions," S. Nandi, invited talk presented at 32nd International Conference on High Energy Physics, Beijing, China, Aug 16 - 22, 2004.

(e) "Neutrino masses and the quest for unification", K.S. Babu, Physics Department Colloquium presented at the University of Arizona, November 2004.

(f) "Dihedral families of quarks, leptons and Higgs bosons", K.S. Babu, High Energy Physics seminar at the University of Minnesota, December, 2004.

(g) "Dihedral families of quarks, leptons and Higgs bosons", K.S. Babu, Seminar at University of Arizona, November 2004.

(h) "Fun with anomalous U(1) symmetry - and solutions to some Standard Model problems", K.S. Babu, Seminar at Kanazawa Univeristy, July 2004.

(i) "Fun with anomalous U(1) symmetry - and solutions to some Standard Model problems", K.S. Babu,Seminar at KEK, Japan, June 2004.

(j) "Anomalous U(1) symmetry and a solution to the Standard Model puzzles", K.S. Babu, Seminar at MIT, April (2004).

(k) "Measurements of the Masses, Mixing, and Lifetimes of B Hadrons at the Tevatron," M. Strauss, invited talk at the Santa Cruz Institute for Particle Physics, Santa Cruz, CA, October 25, 2004.

(l) "Top cross section measurement in the lepton + jets channel with b-tagging at D0", A. Khanov, Fermilab Joint Experimental-Theoretical Seminar, Oct. 9, 2004.

(m) "Indirect Search for Neutralino Dark Matter with Higgs Connections", C. Kao, Stanford Linear Accelerator Center, Menlo Park, California, July 14, 2004.

(n) "Topics in Higgs Phenomenology", C. Kao, Brookhaven National Laboratory, Upton, New York, November 3, 2004.

(o) "Neutralino Dark Matter in Supersymmetric Models", C. Kao, National Central University, Chungli, Taiwan, December 27, 2004.

(p) "Topics in Higgs Phenomenology", C. Kao, National Central University, Chungli, Taiwan, December 29, 2004.

Personnel supported by the EPScOR DOE grant

Faculty

- OSU: F. Rizatdinova, A. Khanov, S. Nandi, K.S. Babu
- OU: K. Milton, M. Strauss, P. Gutierrez
- LU: J. Snow

Research Scientists/Engineers

- OU: K. Arunachalam, H. Severini, R. Boyd

Postdocs

- OU: M. Saleem, S. Jain, G. Huang

Graduate students

- OSU: C. Rujoiu, K. Wang, R. Ghavri, A. Bachri, T. Enkhbat, S. Gabriel, B. Grossmann, C. Anoka, Y. Meng, E. Murdock, H. Hegab, M. Su, A. Patra, B. Abi, J. Julio, A. Albaid, D. Karaback, S. Khan, S. Chakdar, D. Sidorov
- OU: C. Gaspe, R.M. Lebbai, D. Jana, S. Gunawardana, M. Rominsky, P. Rupasinghe, J. Wagner, S. Norberg, A. Jayasinghe, P. Parashar, C. Bertsche, A. Hasib, B. Pearson, K. Prasad, S. Sachithanandam, P. Wickramarachchi

Undergraduate students

- OSU: S. Shibata
- OU: D. Harper, T. Kennington, M. Wilkinson, S. Gosse

Administrative Assistant

- OU: M. Morrison

Current and pending support

OSU

- "Theoretical and Experimental Research in Weak, Electromagnetic and Strong Interactions," DOE, S. Nandi (PI), K. Babu, F. Rizatdinova. Project Period: 5/1/11-4/30/12. Total amount: $311,000
- "Search for Higgs boson at the Tevatron," DOE, F. Rizatdinova (PI). Project Period: 9/1/11-8/31/12. Total amount: $31,000
- "Quarknet Program," University of Notre Dame, F. Rizatdinova (PI). Project Period: 4/3/07-8/31/12. Total amount: $42,840
- "Developments for a Novel Pixel Tracking Layer for the Atlas Detector," NSF/ CA Santa Cruz, F. Rizatdinova (PI). Project Period: 10/1/10-9/30/12. Total amount: $80,000
- "Theoretical and Experimental Research in Weak, Electromagnetic and Strong Interactions," DOE, S. Nandi (PI), K. Babu, F. Rizatdinova. Project period: 5/1/12 - 4/30/13. Total amount: $341,000 (pending)
- "CAREER: Search for new physics in final states with top-antitop quark pairs and additional b-jets at the LHC," NSF, A. Khanov. Project period: 5/1/12 - 4/30/17. Total amount: $807,609 (pending)
- "Search for New Physics with Top & Bottom Quarks with ATLAS," DOE, A. Khanov. Project period: 5/1/12 - 4/30/15. Total amount: $230,381 (pending)

OU Task A

- "University of Oklahoma, High Energy Physics, Task A," US Department of Energy, DE-FG02-04ER41305, Pat Skubic (PI), Brad Abbott, Phillip Gutierrez, Mike Strauss. Budget Period: 5/1/11 - 4/30/12. Total award amount: $542,000
- "MRI Consortium: Developments for a Novel Pixel Tracking Layer for the ATLAS Detector" NSF through UCSC Subcontract, P. Skubic (PI), Brad Abbott, Phillip Gutierrez, Mike Strauss. Project Period: 10/1/10 - 9/30/14. Total award amount: $340,000
- "Maintenance and Operation of the ATLAS Detector" DOE through BNL Subcontract, P. Skubic (PI) Project Period: 10/1/11 - 9/30/12. Total award amount: $45,663
- "Southwest Tier 2 Proposal for ATLAS" NSF through UTA Subcontract, P. Skubic (PI), B. Abbott, P. Gutierrez, M. Strauss Project Period: 9/1/2005 - 1/31/12. Total award amount: $400,000
- "Quarknet" US National Science Foundation P. Gutierrez, M. Strauss (PIs), Project Period: 8/30/11 - 9/1/12, Total award amount: $12,500.
- "REU/RET Physics Site at OU" NSF, M. Strauss, co-PI. Project Period: 6/1/11 - 5/21/14.
- "Half salary for sabbatical on D0", Fermilab, P. Gutierrez, PI. Grant period: 8/15/11 - 5/15/12. Total amount: $59,223

- "Supplement to Task A to cover travel to Fermilab", DOE, Phil Gutierrez. Total amount $10,000. Grant period 11/1/11 - 5/15/12.
- "University of Oklahoma, High Energy Physics, Task A," US Department of Energy, DE-FG02-04ER41305, Pat Skubic (PI), Brad Abbott, Phillip Gutierrez, Mike Strauss. Budget Period: 5/1/12 - 4/30/13. Total award amount: $507,000 (pending)

OU Task B

- "University of Oklahoma, High Energy Physics, Task B" US Department of Energy, DE-FG02-04ER41305 Kim Milton, PI Chung Kao, Howie Baer, Co-PIs Budget Period: 5/1/11 - 4/30/12 Total award amount: $297,000
- "Collaborative Research: Quantum Vacuum Energy" National Science Foundation, award number 0968492, K. A. Milton, PI Project Period: 9/1/10 - 8/31/13. Total: $329,138
- "Casimir densities for spherical boundaries in de Sitter spacetime" American Physical Society, International Travel Grant, K. A. Milton, PI Aram Saharian Project Period: 8/1/11 - 9/15/11 Total award amount: $2,500
- "Applications of Quantum Vacuum Physics" Julian Schwinger Foundation, K. A. Milton, PI Project Period: 1/1/12 - 12/31/12 Total award amount: $50,000
- "University of Oklahoma, High Energy Physics, Task B" US Department of Energy, DE-FG02-04ER41305 Kim Milton, PI Chung Kao, Howie Baer, Co-PIs Budget Period: 5/1/12 - 4/30/13 Total award amount: $280,000 (pending)

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- "Langston University High Energy Physics," DOE, J. Snow (PI). Project period: 5/15/09 - 5/14/12. Total amount: $210,000
- "Langston University High Energy Physics," DOE, J. Snow (PI). Project period: 5/15/12 - 5/14/15. Total amount: $210,000 (pending)