

Selected Abstracts from Other Physical Review Journals

Abstracts of papers which are published in **other Physical Review journals** and may be of interest to *Physical Review C* readers are printed here. The Editors of *Physical Review C* routinely scan the abstracts of **Physical Review D** papers. Appropriate abstracts of papers in other *Physical Review* journals may be included upon request.

Gaps and critical temperature for color superconductivity. Robert D. Pisarski, *Department of Physics, Brookhaven National Laboratory, Upton, New York 11973-5000*; Dirk H. Rischke, *RIKEN BNL Research Center, Brookhaven National Laboratory, Upton, New York 11973-5000*. (Received 9 July 1999; published 7 February 2000)

Because of a logarithmic enhancement from soft, collinear magnetic gluons, in dense quark matter the gap for a color superconducting condensate with spin zero depends upon the QCD coupling constant g not as $\exp(-1/g^2)$, like in Bardeen, Cooper, and Schrieffer (BCS) theory, but as $\exp(-1/g)$. In weak coupling, the ratio of the transition temperature to the spin-zero gap at zero temperature is the same as in BCS theory. We classify the gaps with spin one, and find that they are of the same order in g as the spin-zero gap. [Phys. Rev. D **61**, 051501 (2000)]

Limit on the tau neutrino mass from $\tau^- \rightarrow \pi^- \pi^+ \pi^- \pi^0 \nu_\tau$. M. Athanas, P. Avery, C. D. Jones, M. Lohner, C. Prescott, A. I. Rubiera, J. Yelton, and J. Zheng, *University of Florida, Gainesville, Florida 32611*; G. Brandenburg, R. A. Briere, A. Ershov, Y. S. Gao, D. Y.-J. Kim, and R. Wilson, *Harvard University, Cambridge, Massachusetts 02138*; T. E. Browder, Y. Li, J. L. Rodriguez, and H. Yamamoto, *University of Hawaii at Manoa, Honolulu, Hawaii 96822*; T. Bergfeld, B. I. Eisenstein, J. Ernst, G. E. Gladding, G. D. Gollin, R. M. Hans, E. Johnson, I. Karliner, M. A. Marsh, M. Palmer, C. Plager, C. Sedlack, M. Selen, J. J. Thaler, and J. Williams, *University of Illinois, Urbana-Champaign, Illinois 61801*; K. W. Edwards, *Carleton University, Ottawa, Ontario, Canada K1S 5B6 and the Institute of Particle Physics, Canada*; R. Janicek and P. M. Patel, *McGill University, Montréal, Québec, Canada H3A 2T8 and the Institute of Particle Physics, Canada*; A. J. Sadoff, *Ithaca College, Ithaca, New York 14850*; R. Ammar, P. Baringer, A. Bean, D. Besson, D. Coppage, R. Davis, S. Kotov, I. Kravchenko, N. Kwak, X. Zhao, and L. Zhou, *University of Kansas, Lawrence, Kansas 66045*; S. Anderson, V. V. Frolov, Y. Kubota, S. J. Lee, R. Mahapatra, J. J. O'Neill, R. Poling, T. Riehle, and A. Smith, *University of Minnesota, Minneapolis, Minnesota 55455*; M. S. Alam, S. B. Athar, A. H. Mahmood, S. Timm, and F. Wappler, *State University of New York at Albany, Albany, New York 12222*; A. Anastassov, J. E. Duboscq, K. K. Gan, C. Gwon, T. Hart, K. Honscheid, H. Kagan, R. Kass, J. Lorenc, H. Schwarthoff, E. von Toerne, and M. M. Zoeller, *Ohio State University, Columbus, Ohio 43210*; S. J. Richichi, H. Severini, P. Skubic, and A. Undrus, *University of Oklahoma, Norman, Oklahoma 73019*; M. Bishai, S. Chen, J. Fast, J. W. Hinson, J. Lee, N. Menon, D. H. Miller, E. I. Shibata, and I. P. J. Shipsey, *Purdue University, West Lafayette, Indiana 47907*; S. Glenn, Y. Kwon, A. L. Lyon, and E. H. Thorndike, *University of Rochester, Rochester, New York 14627*;

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From a data sample of 29058 $\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \pi^0 \nu_\tau$ decays observed in the CLEO detector we derive a 95% confidence upper limit on the tau neutrino mass of 28 MeV. [Phys. Rev. D **61**, 052002 (2000)]

Sterile neutrinos in E_6 and a natural understanding of the vacuum oscillation solution to the solar neutrino puzzle. Z. Chacko and R. N. Mohapatra, *Department of Physics, University of Maryland, College Park, Maryland 20742*. (Received 19 May 1999; published 7 February 2000)

If nature has chosen the vacuum oscillation solution to the solar neutrino puzzle, a key theoretical challenge is to understand the extreme smallness of the $\Delta m_{\nu_e - \nu_x}^2$ ($\sim 10^{-10}$ eV²) required for the

purpose. We find that in a class of models such as $[SU(3)]^3$ or its parent group E_6 , which contains one sterile neutrino ν_{is} for each family, the $\Delta m_{\nu_i - \nu_{is}}^2$ is proportional to the cube of the lepton Yukawa coupling. Therefore fitting the atmospheric neutrino data then predicts the $\nu_e - \nu_{es}$ mass difference square to be $\sim (m_e/m_\mu)^3 \Delta m_{atmos}^2$, where the atmospheric neutrino data are assumed to be solved via the $\nu_\mu - \nu_{\mu s}$ oscillation. This provides a natural explanation of the vacuum oscillation solution to the solar neutrino problem while simultaneously solving the atmospheric neutrino puzzle as well as the Liquid Scintillation Neutrino Detector (LSND) observations. [Phys. Rev. D **61**, 053002 (2000)]

Long baseline neutrino physics with a muon storage ring neutrino source. V. Barger, *Department of Physics, University of Wisconsin, Madison, Wisconsin 53706*; S. Geer, *Fermi National Accelerator Laboratory, P.O. Box 500, Batavia, Illinois 60510*; K. Whisnant, *Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011*. (Received 24 June 1999; published 8 February 2000)

We examine the physics capabilities of known flavor neutrino beams from intense muon sources. We find that long-baseline neutrino experiments based on such beams can provide precise measurements of neutrino oscillation mass and mixing parameters. Furthermore, they can test whether the dominant atmospheric neutrino oscillations are $\nu_\mu \rightarrow \nu_\tau$ and/or $\nu_\mu \rightarrow \nu_s$, determine the $\nu_\mu \rightarrow \nu_e$ content of atmospheric neutrino oscillations, and measure $\nu_e \rightarrow \nu_\tau$ appearance. Depending on the oscillation parameters, they may be able to detect Earth matter and CP violation effects and to determine the ordering of some of the mass eigenstates. [Phys. Rev. D **61**, 053004 (2000)]

Can lepton flavor violating interactions explain the atmospheric neutrino problem? Sven Bergmann, *Department of Particle Physics, Weizmann Institute of Science, Rehovot 76100, Israel*; Yuval Grossman, *Stanford Linear Accelerator Center, Stanford University, Stanford, California 94309*; Damien M. Pierce, *Brookhaven National Laboratory, Upton, New York 11973*. (Received 8 October 1999; published 8 February 2000)

We investigate whether flavor changing neutrino interactions (FCNIs) can be sufficiently large to provide a viable solution to the atmospheric neutrino problem. Effective operators induced by heavy boson exchange that allow for flavor changing neutrino scattering off quarks or electrons are related by an $SU(2)_L$ rotation to operators that induce anomalous tau decays. Since $SU(2)_L$ violation is small for new physics at or above the weak scale, one can use the upper bounds on lepton flavor violating tau decays or on lepton universality violation to put severe, model-independent bounds on the relevant non-standard neutrino interactions. Also Z -induced flavor changing neutral currents, due to heavy singlet neutrinos, are too small to be relevant for the atmospheric neutrino anomaly. We conclude that the FCNI solution to the atmospheric neutrino problem is ruled out. [Phys. Rev. D **61**, 053005 (2000)]

Ergodic properties of classical $SU(2)$ lattice gauge theory. J. Bolte, *Abteilung Theoretische Physik, Universität Ulm, D-89069 Ulm, Germany*; B. Müller, *Department of Physics, Duke University, Durham, North Carolina 27708 and Institut für Theoretische Physik, Universität Regensburg, D-93040 Regensburg, Germany*; A. Schäfer, *Institut für Theoretische Physik, Universität Regensburg, D-93040 Regensburg, Germany*. (Received 30 June 1999; published 10 February 2000)

We investigate the relationship between the Lyapunov exponents of periodic trajectories, the average and fluctuations of Lyapunov exponents of ergodic trajectories, and the ergodic autocorrelation time for the two-dimensional hyperbola billiard. We then study the fluctuation properties of the ergodic Lyapunov spectrum of classical $SU(2)$ gauge theory on a lattice. Our results are consistent with the notion that this system is globally hyperbolic. Among the many powerful theorems applicable to such systems, we discuss one relating to the fluctuations in the entropy growth rate. [Phys. Rev. D **61**, 054506 (2000)]

Constraining an R -parity violating supersymmetric theory from the SuperKamiokande data on atmospheric neutrinos. Aseshkrishna Datta, Biswarup Mukhopadhyaya, and Sourov Roy, *Mehta Research Institute, Chhatnag Road, Jhusi, Allahabad - 211 019, India*. (Received 1 June 1999; published 9 February 2000)

The constraints on an R -parity violating supersymmetric theory arising from the recent SuperKamiokande results on atmospheric neutrinos are studied, with special reference to a scenario with bilinear R -parity violating terms. Considering both the fermionic and scalar sectors, we find that a large area of the parameter space is allowed, in terms of both the lepton-number violating entries in the superpotential and the soft R -violating terms in the scalar potential, and that no fine-tuning is required. However, the need to avoid flavor changing neutral currents puts additional restrictions on the theory, requiring either the R -violating terms in the superpotential to be smaller than the R -conserving ones, or a hierarchy in the R -violating parameters for different lepton flavors in the superpotential. [Phys. Rev. D **61**, 055006 (2000)]

Spin content of the nucleon. N. F. Nasrallah, *Institut de Physique Nucléaire, Université Paris XI, F-91406 Orsay Cedex, France and Faculty of Science, Lebanese University, Tripoli, Lebanon*. (Received 1 June 1999; published 7 February 2000)

A QCD sum rule calculation of Balitsky and Ji on the spin content of the nucleon is done with a different approach to the evaluation of the bilocal contributions and to the extraction of the nucleon pole residues. The result obtained is much more numerically stable which puts their conclusion that more than half of the nucleon spin is carried by gluons on firmer ground. [Phys. Rev. D **61**, 056002 (2000)]

Bimaximal neutrino mixing pattern reexamined. Zhi-zhong Xing, *Sektion Physik, Universität München, Theresienstrasse 37A, 80333 München, Germany*. (Received 27 September 1999; published 1 February 2000)

I propose a simple extension of the bi-maximal neutrino mixing pattern, allowing slight coupling between solar and atmospheric neutrino oscillations as well as large CP violation. The new scenario is compatible with either the vacuum oscillation solution or the large-angle MSW solution to the solar neutrino problem. [Phys. Rev. D **61**, 057301 (2000)]

Long range neutrino forces in the cosmic relic neutrino background. F. Ferrer and J. A. Grifols, *Grup de Física Teòrica and Institut de Física d'Altes Energies, Universitat Autònoma de Barcelona, 08193 Bellaterra, Barcelona, Spain*; M. Nowakowski, *Instituto de Física Teórica, Universidade Estadual Paulista, Rua Pamplona 145, 01405-900 São Paulo, Brazil*. (Received 6 July 1999; published 10 February 2000)

Neutrinos mediate long range forces among macroscopic bodies in a vacuum. When the bodies are placed in the neutrino cosmic background, these forces are modified. Indeed, at distances long compared to the scale T^{-1} , the relic neutrinos completely screen off the two-neutrino exchange force, whereas for small distances the interaction remains unaffected. [Phys. Rev. D **61**, 057304 (2000)]

Nonequilibrium weak processes in kaon condensation. I. Reaction rate for the thermal kaon process. Takumi Muto, *Department of Physics, Chiba Institute of Technology, 2-1-1 Shibazono, Narashino, Chiba 275-0023, Japan*; Toshitaka Tatsumi, *Department of Physics, Kyoto University, Kyoto 606-8502, Japan*; Naoki Iwamoto, *Department of Physics and Astronomy, The University of Toledo, Toledo, Ohio 43606-3390*. (Received 27 May 1999; published 23 February 2000)

We investigate the thermal kaon process, in which kaons are thermally produced via nucleon-nucleon collisions. This process is relevant to the nonequilibrium dynamics of kaon condensation inside neutron stars. The reaction rates for these processes are calculated, and their temperature and density dependences are compared with those of other reaction rates. It is shown that the thermal kaon process is dominant over other relevant weak reactions throughout the nonequilibrium process, such as the kaon-induced Urca and the modified Urca reactions, and may control the entire evolution of the

kaon condensate. The characteristic role of soft and hard kaons during the evolution is explained, and implications for astrophysical phenomena are briefly discussed. [Phys. Rev. D **61**, 063001 (2000)]

Nucleon spin polarizability at order $O(p^4)$ in chiral perturbation theory. Xiangdong Ji, Chung-Wen Kao, and Jonathan Osborne, *Department of Physics, University of Maryland, College Park, Maryland 20742*. (Received 31 August 1999; published 17 February 2000)

We calculate the forward spin-dependent photon-nucleon Compton amplitude as a function of photon energy at next-to-leading ($O(p^4)$) order in chiral perturbation theory, from which we extract the contribution to the nucleon spin polarizability. The result shows a large correction to the leading order contribution. [Phys. Rev. D **61**, 074003 (2000)]

Erraticity analysis of multiparticle production. Zhen Cao, *High Energy Astrophysics Institute, Department of Physics, University of Utah, Salt Lake City, Utah 84112*; Rudolph C. Hwa, *Institute of Theoretical Science and Department of Physics, University of Oregon, Eugene, Oregon 97403-5203*. (Received 19 January 1999; revised manuscript received 26 August 1999; published 22 February 2000)

Event-to-event fluctuations of the spatial patterns of the final states of high-energy collisions, referred to as erraticity, are studied for the data generated by a soft-interaction model called ECOMB. The moments $C_{p,q}$ do not show simple power-law dependences on the bin size. New measures of erraticity are proposed that generalize the bin-size dependence. The method should be applied not only to the soft production data of NA22 and NA27 to check the dynamical content of ECOMB, but also to other collision processes, such as e^+e^- annihilation and heavy-ion collisions. [Phys. Rev. D **61**, 074011 (2000)]