

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.

Is a large mixing angle MSW effect the solution of the solar neutrino problems? J. N. Bahcall, *School of Natural Sciences, Institute for Advanced Study, Princeton, New Jersey 08540*; P. I. Krastev, *University of Wisconsin–Madison, Department of Physics, Madison, Wisconsin 53706*; A. Yu. Smirnov, *International Center for Theoretical Physics, 34100 Trieste, Italy*. (Received 6 May 1999; published 4 October 1999)

Recent results on solar neutrinos provide hints that the LMA MSW solution could be correct. We perform accurate calculations for potential “smoking-gun” effects of the LMA solution in the SuperKamiokande solar neutrino experiment, including (1) an almost constant reduction of the standard recoil electron energy spectrum (with a weak, $<10\%$, relative increase below 6.5 MeV), (2) an integrated difference in day-night rates (2%–14%), (3) an approximately constant zenith-angle dependence of the nighttime event rate, (4) a new test for the difference in the shape of the equally normalized day-night energy spectra ($\sim 1\%$), and (5) annual variations of the signal due to the regeneration effect (~ 6 times smaller than the integrated day-night effect). We also establish a relation between the integrated day-night asymmetry and the seasonal asymmetry due to LMA regeneration. As a cautionary example, we simulate the effect of an absolute energy calibration error on the shape (distortion) of the recoil energy spectrum. We compare LMA predictions with the available SuperKamiokande data for 708 days of operation and discuss the possibilities for distinguishing experimentally between LMA and vacuum oscillations. If LMA is correct, global solutions combining data from different types of measurements made by SuperKamiokande or by different solar neutrino experiments could reveal in the next few years a many σ indication of neutrino oscillations. [S0556-2821(99)07919-9] [Phys. Rev. D **60**, 093001 (1999)]

Neutrino oscillations and mixings with three flavors. Tommy Ohlsson and Håkan Snellman, *Theoretical Physics, Department of Physics, Royal Institute of Technology, SE-100 44 Stockholm, Sweden*. (Received 4 March 1999; published 7 October 1999)

Global fits to all data of candidates for neutrino oscillations are presented in the framework of a three-flavor model. The analysis excludes mass regions where the MSW effect is important for the solar neutrino problem. The best fit gives $\theta_1 \approx 28.9^\circ$, $\theta_2 \approx 4.2^\circ$, $\theta_3 \approx 45.0^\circ$, $m_2^2 - m_1^2 \approx 2.87 \times 10^{-4} \text{ eV}^2$, and $m_3^2 - m_2^2 \approx 1.11 \text{ eV}^2$ indicating essentially maximal mixing between the two lightest neutrino mass eigenstates. [S0556-2821(99)03919-3] [Phys. Rev. D **60**, 093007 (1999)]

Neutrino propagation in matter with general interactions. Sven Bergmann, *Department of Particle Physics, Weizmann Institute of Science, Rehovot 76100, Israel*; Yuval Grossman, *Stanford Linear Accelerator Center, Stanford University, Stanford, California*

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We present a general analysis of the effective potential for neutrino propagation in matter, assuming a generic set of Lorentz invariant non-derivative interactions. We find that in addition to the known vector and axial vector terms, in a polarized medium also tensor interactions can play an important role. We compute the effective potential arising from a tensor interaction. We show that the components of the tensor potential transverse to the direction of the neutrino propagation can induce a neutrino spin flip, similar to the one induced by a transverse magnetic field. [S0556-2821(99)00219-2] [Phys. Rev. D **60**, 093008 (1999)]

Seasonal dependence in the solar neutrino flux. P. C. de Holanda, *Instituto de Física Corpuscular – C.S.I.C., Departamento de Física Teórica, Universitat of València, 46100 Burjassot, València, Spain* and *Instituto de Física Gleb Wataghin, Universidade Estadual de Campinas, UNICAMP 13083-970 – Campinas, Brazil*; C. Peña-Garay, M. C. Gonzalez-Garcia, and J. W. F. Valle, *Instituto de Física Corpuscular – C.S.I.C., Departamento de Física Teórica, Universitat of València, 46100 Burgassot, València, Spain*. (Received 24 March 1999; published 8 October 1999)

Mikheyev-Smirnov-Wolfenstein (MSW) solutions of the solar neutrino problem predict a seasonal dependence of the zenith angle distribution of the event rates, due to the nonzero latitude at the Super-Kamiokande site. We calculate this seasonal dependence and compare it with the expectations in the no-oscillation case as well as just-so scenario, in the light of the latest Super-Kamiokande 708-day data. The seasonal dependence can be sizable in the large mixing angle MSW solution and would be correlated with the day-night effect. This may be used to discriminate between MSW and just-so scenarios and should be taken into account in refined fits of the data. [S0556-2821(99)08419-2] [Phys. Rev. D **60**, 093010 (1999)]

Seasonal variations of the ^7Be solar neutrino flux. André de Gouvêa, Alexander Friedland, and Hitoshi Murayama, *Theoretical Physics Group, Ernest Orlando Lawrence Berkeley National Laboratory, University of California, Berkeley, California 94720* and *Department of Physics, University of California, Berkeley, California 94720*. (Received 10 May 1999; published 11 October 1999)

Measuring the ^7Be solar neutrino flux is crucial towards solving the solar neutrino puzzle. The Borexino experiment, and possibly the KamLAND experiment, will be capable of studying the ^7Be neutrinos in the near future. We discuss (1) how the seasonal varia-

tion of the Borexino and KamLAND data can be used to measure the ^7Be solar neutrino flux in a background independent way and (2) how anomalous seasonal variations might be used to discover vacuum neutrino oscillations, independent of the solar model and the measurement of the background. In particular, we find that, after three years of Borexino or KamLAND running, vacuum neutrino oscillations can be either established or excluded for almost all values of $(\sin^2 2\theta, \Delta m^2)$ preferred by the Homestake, GALLEX, SAGE, and Super-Kamiokande data. We also discuss how well seasonal variations of the data can be used to measure $(\sin^2 2\theta, \Delta m^2)$ in the case of vacuum oscillations. [S0556-2821(99)04719-0] [Phys. Rev. D **60**, 093011 (1999)]

Superfluidity in a model of massless fermions coupled to scalar bosons. Robert D. Pisarski, *Department of Physics, Brookhaven National Laboratory, Upton, New York 11973*; Dirk H. Rischke, *RIKEN-BNL Research Center, Brookhaven National Laboratory, Upton, New York 11973*. (Received 9 March 1999; published 7 October 1999)

We study superfluidity in a model of massless fermions coupled to a massive scalar field through a Yukawa interaction. Gap equations for a condensate with total spin $J=0$ are solved in the mean-field approximation. For the Yukawa interaction, the gaps for right- and left-handed fermions are equal in magnitude and opposite in sign, so that condensation occurs in the $J^P=0^+$ channel. At finite scalar mass, there are two different gaps for fermions of a given chirality, corresponding to condensation of particle pairs or of antiparticle pairs. These gaps become degenerate in the limit of infinite scalar mass. [S0556-2821(99)04119-3] [Phys. Rev. D **60**, 094013 (1999)]

Asymptotic scaling and infrared behavior of the gluon propagator. Derek B. Leinweber, Jon Ivar Skullerud, and Anthony G. Williams, *Special Research Centre for the Subatomic Structure of Matter and Department of Physics and Mathematical Physics, University of Adelaide, Adelaide SA 5005, Australia*; Claudio Parrinello, *Department of Mathematical Sciences, University of Liverpool, Liverpool L69 3BX, England*. (Received 23 November 1998;

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The Landau gauge gluon propagator for the pure gauge theory is evaluated on a $32^3 \times 64$ lattice with a physical volume of $(3.35^3 \times 6.7) \text{ fm}^4$. Comparison with two smaller lattices at different lattice spacings allows an assessment of finite volume and finite lattice spacing errors. Cuts on the data are imposed to minimize these errors. Scaling of the gluon propagator is verified between $\beta=6.0$ and $\beta=6.2$. The tensor structure is evaluated and found to be in good agreement with the Landau gauge form, except at very small momentum values, where some small finite volume errors persist. A number of functional forms for the momentum dependence of the propagator are investigated. The form $D(q^2)=D_{\text{IR}}+D_{\text{UV}}$, where $D_{\text{IR}}(q^2) \propto (q^2+M^2)^{-\eta}$ and D_{UV} is an infrared regulated one-loop asymptotic form, is found to provide an adequate description of the data over the entire momentum region studied — thereby bridging the gap between the infrared confinement region and the ultraviolet asymptotic region. The best estimate for the exponent η is $3.2^{+0.1+0.2}_{-0.2-0.3}$, where the first set of errors represents the uncertainty associated with varying the fitting range, while the second set of errors reflects the variation arising from different choices of infrared regulator in D_{UV} . Fixing the form of D_{UV} , we find that the mass parameter M is $(1020 \pm 100) \text{ MeV}$.

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Solar neutrinos and the violation of the equivalence principle. S. W. Mansour and T. K. Kuo, *Department of Physics, Purdue University, West Lafayette, Indiana 47907*. (Received 28 October 1998; published 7 October 1999)

In this Brief Report, a non-standard solution to the solar neutrino problem is reexamined. This solution assumes that neutrino flavors could have different couplings to gravity; hence, the equivalence principle is violated in this mechanism. The gravity induced mixing has the potential of accounting for the current solar neutrino data from several experiments even for massless neutrinos. We fit this solution to the total rate of neutrino events in the SuperKamiokande detector (first 504 days) together with the total rate from other detectors and also with the SuperKamiokande results for the recoil-electron spectrum. [S0556-2821(99)05019-5] [Phys. Rev. D **60**, 097301 (1999)]