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.*

Search for nucleon decay using the IMB-3 detector. C. McGrew,[1] R. Becker-Szendy,[2] C. B. Bratton,[3] J. L. Breault,[1] D. R. Cady,[4] D. Casper,[5] S. T. Dye,[2] W. Gajewski,[1] K. S. Ganezer,[6] M. Goldhaber,[7] T. J. Haines,[8] P. G. Halverson,[1] D. Kiełczewska,[9] W. R. Kropp,[1] J. G. Learned,[2] J. M. LoSecco,[4] S. Matsuno,[2] J. Matthews,[10] G. McGrath,[2] R. Miller,[8] L. R. Price,[1] F. Reines,[1] J. Schultz,[1] D. Sinclair,[10] H. W. Sobel,[1] J. L. Stone,[5] L. R. Sulak,[5] R. Svoboda,[11] and J. C. van der Velde,[10] [1]*University of California, Irvine, California 92697-4575* [2]*University of Hawaii at Manoa, Manoa, Hawaii 96822* [3]*Cleveland State University, Cleveland, Ohio 44115* [4]*University of Notre Dame, Notre Dame, Indiana 46556* [5]*Boston University, Boston, Massachusetts 02215* [6]*California State University at Domingues Hills, Domingues Hills, California 90747* [7]*Brookhaven National Laboratory, Upton, New York 11973-5000* [8]*Los Alamos National Laboratory, Los Alamos, New Mexico 87545* [9]*Warsaw University, Warsaw, Poland* [10]*University of Michigan at Ann Arbor, Ann Arbor, Michigan 48109-1120* [11]*Louisiana State University, Baton Rouge, Louisiana 70803-4001.* (Received 29 May 1997; published 10 February 1999)

The IMB-3 experiment was a large water Cherenkov ring imaging detector with a fiducial mass of 3.3 kton. During a 7.6-kton-year exposure ($\sim 4.6\times 10^{33}$ nucleon yr) 935 contained events were observed. The observed rate and characteristics are consistent with the expected backgrounds from atmospheric neutrinos. Lower limits on the nucleon lifetime are set for a wide variety of proposed decay modes. [S0556-2821(98)00323-3] [Phys. Rev. D **59**, 052004 (1998)]

Neutrino oscillations in space within a solvable model. Ara Ioannisian and Apostolos Pilaftsis, *Max-Planck-Institut für Physik (Werner-Heisenberg-Institut), Föhringer Ring 6, 80805 Munich, Germany.* (Received 23 September 1998; published 9 February 1999)

We study neutrino oscillations in space within a realistic model in which both the source and the target are considered to be stationary having Gaussian-form localizations. The model admits an exact analytic solution in field theory which may be expressed in terms of complementary error functions, thereby allowing for a quantitative discussion of quantum-mechanical (coherent) versus statistical (incoherent) uncertainties. The solvable model provides an insightful framework in addressing questions related to propagation and oscillation of neutrinos that may not be attainable by the existing approaches. We find a novel form of plane-wave behavior of neutrino oscillations if the localization spread of the source and target states due to quantum mechanics is of macroscopic size but much smaller than neutrinos' oscillation length. Finally, we discuss the limits on the coherence length of neutrino oscillations and find that they mainly arise from uncertainties of statistical origin. [S0556-2821(99)04703-7] [Phys. Rev. D **59**, 053003 (1999)]

Universal seesaw mass matrix model with three light pseudo Dirac neutrinos. Yoshio Koide, *Department of Physics, University of Shizuoka, 52-1 Yada, Shizuoka 422-8526, Japan;* Hideo Fusaoka, *Department of Physics, Aichi Medical University, Nagakute, Aichi 480-1195, Japan.* (Received 29 June 1998; published 9 February 1999)

A universal seesaw mass matrix model, which gives a successful description of the quark mass matrix in terms of lepton masses, yields three ''sterile'' neutrinos ν_i^s, which compose pseudo-Dirac neutrinos $\nu_{i\pm}^{ps}\simeq(\nu_i\pm\nu_i^s)/\sqrt{2}$ together with active neutrinos $\nu_i(i=e,\mu,\tau)$. The solar and atmospheric neutrino data are explained by the mixings $\nu_e\leftrightarrow\nu_e^s$ and $\nu_\mu\leftrightarrow\nu_\mu^s$, respectively. In spite of such observations of the large mixing $\sin^2 2\theta\simeq 1$ in the disappearance experiments, effective mixing parameters $\sin^2 2\theta^{\alpha\beta}$ in appearance experiments $\nu_\alpha\rightarrow\nu_\beta(\alpha,\beta=e,\mu,\tau)$ are highly suppressed. [S0556-2821(99)01305-3] [Phys. Rev. D **59**, 053004 (1999)]

Resonances in radiative hyperon decays. Buğra Borasoy and Barry R. Holstein, *Department of Physics and Astronomy, University of Massachusetts, Amherst, Massachusetts 01003.* (Received 30 October 1998; published 9 February 1999)

The importance of resonances for the radiative hyperon decays is examined in the framework of chiral perturbation theory. Low lying baryon resonances are included into the effective theory and tree contributions to these decays are calculated. We find significant contributions to both the parity-conserving and parity-violating decay amplitudes and a large negative value for the asymmetry parameter in polarized $\Sigma^+\rightarrow p\gamma$ is found, in agreement with the experimental result $\alpha_\gamma^{p\Sigma^+}=-0.76\pm 0.08$. [S0556-2821(99)05305-9] [Phys. Rev. D **59**, 054019 (1999)]

Neutrinos in a gravitational background: A test for the universality of the gravitational interaction. H. Casini,[1] J. C. D'Olivo,[2] R. Montemayor,[1] and L. F. Urrutia,[1] [1]*Centro Atómico Bariloche and Instituto Balseiro, CNEA and Universidad Nacional de Cuyo, 8400 San Carlos de Bariloche, Río Negro, Argentina* [2]*Departamento de Física de Altas Energías - Instituto de Ciencias Nucleares, Universidad Nacional Autónoma de México, Apartado Postal 70-543, 04510 México, Distrito Federal, México.* (Received 2 November 1998; published 12 February 1999)

 ©1999 The American Physical Society

In this work we propose an extended formulation for the interaction between neutrinos and gravitational fields. It is based on the parametrized post-Newtonian approach, and includes a violation of the universality of the gravitational interaction which is nondiagonal in weak flavor space. We find new effects that are not considered in the standard scenario for violation of the equivalence principle. They are of the same order as the effects produced by the Newtonian potential, but they are highly directional dependent and could provide a very clean test of that violation. Phenomenological consequences are briefly discussed.
[S0556-2821(99)07904-7] [Phys. Rev. D **59**, 062001 (1999)]

Neutrino conversions in random magnetic fields and $\tilde{\nu}_e$ from the Sun. A. A. Bykov,[1] V. Yu. Popov,[1] A. I. Rez,[2] V. B. Semikoz,[3] D. D. Sokoloff,[1] [1]*Department of Physics, Moscow State University, 119899, Moscow, Russia* [2]*The Institute of the Terrestrial Magnetism, the Ionosphere and Radio Wave Propagation of the Russian Academy of Sciences, Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation of Russian Academy of Sciences, Troitsk, Moscow region, 142092, Russia* [3]*Instituto de Física Corpuscular - C.S.I.C., Departament de Física Teòrica, Universitat de València, 46100 Burjassot, València, Spain.* (Received 7 August 1998; published 2 February 1999)

The magnetic field in the convective zone of the Sun has a random small-scale component with the rms value substantially exceeding the strength of a regular large-scale field. For two Majorana neutrino flavors × two helicities in the presence of a neutrino transition magnetic moment and nonzero neutrino mixing we analyze the displacement of the allowed $(\Delta m^2 - \sin^2 2\theta)$-parameter region reconciled for the SuperKamiokande (SK) and radiochemical (GALLEX, SAGE, Homestake) experiments in dependence on the rms magnetic field value b, or more precisely, on a value μb assuming the transition magnetic moment $\mu = 10^{-11}\mu_B$. In contrast with resonant spin-flavor precession in regular magnetic fields we find an effective production of electron antineutrinos in the Sun even for small neutrino mixing through the cascade conversions $\nu_{eL} \to \nu_{\mu L} \to \tilde{\nu}_{eR}$, $\nu_{eL} \to \overline{\nu}_{\mu R} \to \overline{\nu}_{eR}$ in a random magnetic field that would be a signature of the Majorana nature of neutrino if $\tilde{\nu}_{eR}$ will be registered. Based on the present SK bound on electron antineutrinos we also find an excluded area in the same $\Delta m^2, \sin^2 2\theta$ plane and reveal a strong sensitivity to the random magnetic field correlation length L_0. [S0556-2821(99)00804-8] [Phys. Rev. D **59**, 063001 (1999)]

Big bang nucleosynthesis and active-sterile neutrino mixing: Evidence for maximal $\nu_\mu \leftrightarrow \nu_\tau$ mixing in Super Kamiokande? Xiangdong Shi and George M. Fuller, *Department of Physics, University of California, San Diego, La Jolla, California 92093-0319.* (Received 14 September 1998; revised manuscript received 28 December 1998; published 17 February 1999)

We discuss big bang nucleosynthesis constraints on maximal $\nu_\mu \leftrightarrow \nu_s$ mixing. Vacuum $\nu_\mu \leftrightarrow \nu_s$ oscillation has been proposed as one possible explanation of the Super Kamiokande atmospheric neutrino data. Based on the most recent primordial abundance measurements, we find that the effective number of neutrino species for big bang nucleosynthesis (BBN) is $N_\nu \lesssim 3.3$. Assuming that all three active neutrinos are light (with masses $\ll 1$ MeV), we examine BBN constraints on $\nu_\mu \leftrightarrow \nu_s$ mixing in two scenarios: (1) a negligible lepton asymmetry (the standard picture) and (2) the presence of a large lepton asymmetry which has resulted from an amplification by $\nu_\tau \leftrightarrow \nu_{s'}$ mixing ($\nu_{s'}$ being ν_s or another sterile neutrino species). The latter scenario has been proposed recently to reconcile the BBN constraints and large-angle $\nu_\mu \leftrightarrow \nu_s$ mixing. We find that the large-angle $\nu_\mu \leftrightarrow \nu_s$ mixing in the first scenario, which would yield $N_\nu \approx 4$, is ruled out as an explanation of the Super Kamiokande data. It is conceivably possible for the $\nu_\mu \leftrightarrow \nu_s$ solution to evade BBN bounds in the second scenario, but only if $200\,\mathrm{eV}^2 \lesssim m^2_{\nu_\tau} - m^2_{\nu_{s'}} \lesssim 10^4\,\mathrm{eV}^2$ is satisfied, and if ν_τ decays non-radiatively with a lifetime $\lesssim 10^3$ yr. This mass-squared difference implies $15\,\mathrm{eV} \lesssim m_{\nu_\tau} \lesssim 100\,\mathrm{eV}$ if $\nu_{s'}$ is much lighter than ν_τ. We conclude that maximal (or near maximal) $\nu_\mu \leftrightarrow \nu_\tau$ mixing is a more likely explanation of the Super Kamiokande data. [S0556-2821(99)00504-4] [Phys. Rev. D **59**, 063006 (1999)]

Meson-meson interactions in a nonperturbative chiral approach. J. A. Oller and E. Oset, *Departamento de Física Teórica and IFIC, Centro Mixto Universidad de Valencia-CSIC, 46100 Burjassot (Valencia), Spain;* J. R. Peláez, *Stanford Linear Accelerator Center, Stanford University, Stanford, California 94309.* (Received 9 April 1998; published 16 February 1999)

A nonperturbative method which combines constraints from chiral symmetry breaking and coupled channel unitarity is used to describe the meson-meson interaction up to about 1.2 GeV. The approach uses the $\mathcal{O}(p^2)$ and $\mathcal{O}(p^4)$ chiral Lagrangians. The seven free parameters of the $\mathcal{O}(p^4)$ Lagrangian are fitted to the data. The results are in good agreement with a vast amount of experimental analyses. The amplitudes develop poles in the complex plane corresponding to the f_0, a_0, ρ, K^*, ϕ, σ, and κ resonances, the latter two being very broad. The total and partial decay widths of the resonances are also well reproduced. Further extensions and applications of this chiral nonperturbative scheme are also discussed. [S0556-2821(99)05003-1] [Phys. Rev. D **59**, 074001 (1999)]

New experimental methods for the determination of the *P* parity of *K* mesons. Namık K. Pak and M. P. Rekalo, *Department of Physics, Middle East Technical University, Ankara, Turkey.* (Received 12 January 1998; published 16 February 1999)

We propose new methods to determine the P parity of the K mesons experimentally, based on the measurement of polarization observables in K-meson production in polarized proton-proton collisions. The first method is based on the measurement of the sign of the spin correlation coefficient with transversally polarized protons. The second one is based on the measurement of the polarization transfer coefficient from the initial proton to the produced hyperon. [S0556-2821(99)01905-0] [Phys. Rev. D **59**, 077501 (1999)]