

Selected Abstracts from Physical Review D

Abstracts of papers published in Physical Review D which may be of interest to our readers are printed here.

Topologically nontrivial time-dependent chiral condensates. Mahiko Suzuki, *Department of Physics and Lawrence Berkeley National Laboratory, University of California, Berkeley, California 94720.* (Received 8 July 1996)

Topologically nontrivial time-dependent solutions of the classical nonlinear σ model are studied as candidates of the disoriented chiral condensate (DCC) in 3+1 dimensions. Unlike the analytic solutions so far discussed, these solutions cannot be transformed into isospin-uniform ones by chiral rotations. If they are produced as DCC's, they can be detected by a distinct pattern in the angle-rapidity distribution of the neutral-to-charged pion ratio. [S0556-2821(96)50322-X] [Phys. Rev. D **54**, 5922 (1996)]

Baryon number segregation at the end of the cosmological quark-hadron transition. Luciano Rezzolla, *SISSA—Scuola Internazionale Superiore di Studi Avanzati, International School for Advanced Studies, Trieste, Italy and Physics Department, University of Illinois at Urbana-Champaign, 1110 W. Green St., Urbana, Illinois 61820.* (Received 16 July 1996)

One of the most interesting questions regarding a possible first order cosmological quark-hadron phase transition concerns the final fate of the baryon number contained within the disconnected quark regions at the end of the transition. We here present a detailed investigation of the hydrodynamical evolution of an evaporating quark drop, using a multicomponent fluid description to follow the mechanisms of baryon number segregation. With this approach, we are able to take account of the simultaneous effects of baryon number flux suppression at the phase interface, entropy extraction by means of particles having long mean free paths, and baryon number diffusion. A range of computations has been performed to investigate the permitted parameter space and this has shown that significant baryon number concentrations, perhaps even up to densities above that of nuclear matter, represent an inevitable outcome within this scenario. [S0556-2821(96)04622-X] [Phys. Rev. D **54**, 6072 (1996)]

Polarized Λ 's in the current fragmentation region. R. L. Jaffe, *Center for Theoretical Physics, Laboratory for Nuclear Science, and Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139 and Lyman Physics Laboratory, Harvard University, Cambridge, Massachusetts 02138.* (Received 16 July 1996)

Data on the nucleon spin structure suggests that the u - (and d -) quark distributions in the Λ hyperon may be polarized. If this correlation carries over into fragmentation, then the study of polarized Λ 's in the current fragmentation region of deep inelastic lepton scattering will be a sensitive probe of the nucleon spin structure. Λ production by polarized electrons from unpolarized targets can

search for this correlation. If it is significant, Λ production by unpolarized electrons from longitudinally and transversely polarized targets can probe the u -quark helicity and transversity distributions in the nucleon. [S0556-2821(96)50123-2] [Phys. Rev. D **54**, 6581 (1996)]

Remarks on the hadronic effect in muon $g-2$: Low energy behavior of $V^0-\pi^+$ scattering. M. Hayakawa, *Department of Physics, National Laboratory for High Energy Physics (KEK), Tsukuba, Ibaraki, Japan 305.* (Received 5 August 1996)

The behavior of the $V^0-\pi^+$ scattering amplitude (where $V^0=\rho^0, \omega$, or ϕ) in the low pion momentum limit is studied, motivated by its relevance to the theory of muon $g-2$. Current algebra analysis shows that its S -wave component must vanish in the chiral limit under general physical assumptions. We confirm this result with various low energy models of the vector meson. Our result justifies the calculation of the charged pion loop part of the hadronic light-by-light scattering contribution to muon $g-2$ within the framework of the hidden local symmetry model of low energy hadron dynamics. [S0556-2821(96)50223-7] [Phys. Rev. D **54**, 6586 (1996)]

Deep inelastic scattering of polarized electrons by polarized ^3He and the study of the neutron spin structure. P. L. Anthony,^{7,12} R. G. Arnold,¹ H. R. Band,¹⁶ H. Borel,⁵ P. E. Bosted,¹ V. Breton,² G. D. Cates,¹¹ T. E. Chupp,⁸ F. S. Dietrich,⁷ J. Dunne,¹ R. Erbacher,¹³ J. Fellbaum,¹ H. Fonvieille,² R. Gearhart,¹² R. Holmes,¹⁴ E. W. Hughes,^{4,12} J. R. Johnson,¹⁶ D. Kallow,¹³ C. Keppel,¹ S. E. Kuhn,^{13,10} R. M. Lombard-Nelsen,⁵ J. Marroncle,⁵ T. Maruyama,^{16,12} W. Meyer,¹² Z.-E. Meziani,^{13,15} H. Middleton,¹¹ J. Morgenstern,⁵ N. R. Newbury,¹¹ G. G. Petratos,^{6,12} R. Pitthan,¹² R. Prepost,¹⁶ Y. Roblin,² S. E. Rock,¹ S. H. Rokni,¹² G. Shapiro,³ T. Smith,⁸ P. A. Souder,¹⁴ M. Spengos,¹ F. Staley,⁵ L. M. Stuart,¹² Z. M. Szalata,¹ Y. Terrien,⁵ A. K. Thompson,⁹ J. L. White,^{1,12} M. Woods,¹² J. Xu,¹⁴ C. C. Young,¹² and G. Zapalac¹⁶ (E142 Collaboration) ¹ American University, Washington, D.C. 20016 ² Laboratoire de Physique Corpusculaire, Institut National de Physique Nucléaire et de Physique des Particules, Centre National de la Recherche Scientifique, Université Blaise Pascal, F-63170 Aubière Cedex, France ³ University of California and Lawrence Berkeley Laboratory, Berkeley, California 94720 ⁴ California Institute of Technology, Pasadena, California 91125 ⁵ Centre d'Etudes de Saclay, Département d'Astrophysique, de Physique des Particules de Physique Nucléaire et d'Instrumentation Associée/Service de Physique Nucléaire, F-91191 Gif-sur-Yvette, France ⁶ Kent State University, Kent, Ohio 44242 ⁷ Lawrence Livermore National Laboratory, Livermore, California 94550 ⁸ University of Michigan, Ann Arbor, Michigan 48109 ⁹ National Institute of Standards and Technology, Gaithersburg, Maryland 20899 ¹⁰ Old Dominion Uni-

versity, Norfolk, Virginia 23529 ¹¹ Princeton University, Princeton, New Jersey 08544 ¹² Stanford Linear Accelerator Center, Stanford, California 94309 ¹³ Stanford University, Stanford, California 94305 ¹⁴ Syracuse University, Syracuse, New York 13210 ¹⁵ Temple University, Philadelphia, Pennsylvania 19122 ¹⁶ University of Wisconsin, Madison, Wisconsin 53706. (Received 23 May 1996)

The neutron longitudinal and transverse asymmetries A_1^n and A_2^n have been extracted from deep inelastic scattering of polarized electrons by a polarized ^3He target at incident energies of 19.42, 22.66, and 25.51 GeV. The measurement allows for the determination of the neutron spin structure functions $g_1^n(x, Q^2)$ and $g_2^n(x, Q^2)$ over the range $0.03 < x < 0.6$ at an average Q^2 of 2 (GeV/c)². The data are used for the evaluation of the Ellis-Jaffe and Bjorken sum rules. The neutron spin structure function $g_1^n(x, Q^2)$ is small and negative within the range of our measurement, yielding an integral $\int_{0.03}^{0.6} g_1^n(x) dx = -0.028 \pm 0.006$ (stat) ± 0.006 (syst). Assuming Regge behavior at low x , we extract $\Gamma_1^n = \int_0^1 g_1^n(x) dx = -0.031 \pm 0.006$ (stat) ± 0.009 (syst). Combined with previous proton integral results from SLAC experiment E143, we find $\Gamma_1^p - \Gamma_1^n = 0.160 \pm 0.015$ in agreement with the Bjorken sum rule prediction $\Gamma_1^p - \Gamma_1^n = 0.176 \pm 0.008$ at a Q^2 value of 3 (GeV/c)² evaluated using $\alpha_s = 0.32 \pm 0.05$. [S0556-2821(96)03923-9] [Phys. Rev. D **54**, 6620 (1996)]

Fluctuations and entropy indices of QCD parton showers. Zhen Cao and Rudolph C. Hwa, *Institute of Theoretical Science and Department of Physics, University of Oregon, Eugene, Oregon 97403*. (Received 1 May 1996)

The branching processes in parton showers are studied in perturbative QCD for both quark and gluon jets. The emphasis is on the nature of fluctuations of both the parton multiplicities and the spatial patterns of the final states. Effective measures of such fluctuations are calculated from the data obtained by Monte Carlo simulations. The entropy indices are used to characterize chaoticity. Both running and fixed couplings are considered. The fixed coupling case is used to study the onset of chaos. Implications of the results are discussed. [S0556-2821(96)01823-1] [Phys. Rev. D **54**, 6674 (1996)]

QCD sum rule calculation for the tensor charge of the nucleon. Hanxin He, *Center for Theoretical Physics, Laboratory for Nuclear Science and Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139 and Institute for Nuclear Theory, University of Washington, Seattle, Washington 98195 and China Institute of Atomic Energy, P.O. Box 275(18), Beijing 102413, China and Institute of Theoretical Physics, Aca-*

demia Sinica, China; Xiangdong Ji, Center for Theoretical Physics, Laboratory for Nuclear Science and Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139 and Institute for Nuclear Theory, University of Washington, Seattle, Washington 98195. (Received 16 July 1996)

The nucleon's tensor charges (isovector $g_T^v = \delta u - \delta d$ and isoscalar $g_T^s = \delta u + \delta d$) are calculated using the QCD sum rules in the presence of an external tensor field. In addition to the standard quark and gluon condensates, new condensates described by vacuum susceptibilities are induced by the external field. The latter contributions to g_T^v and g_T^s are estimated to be small. After deriving some simplifying formulas, a detailed sum rule analysis yields $g_T^v = 1.29 \pm 0.51$ and $g_T^s = 1.37 \pm 0.55$, or $\delta u = 1.33 \pm 0.53$ and $\delta d = 0.04 \pm 0.02$ at the scale of 1 GeV². [S0556-2821(96)04323-8] [Phys. Rev. D **54**, 6897 (1996)]

MSW $\nu_e \rightarrow \nu_s$ transition solution of the solar neutrino problem. P. I. Krastev, *School of Natural Sciences, Institute for Advanced Study, Princeton, New Jersey 08540*; Q. Y. Liu, *Scuola Internazionale Superiore di Studi Avanzati, I-34013 Trieste, Italy*; S. T. Petcov *Scuola Internazionale Superiore di Studi Avanzati, I-34013 Trieste, Italy, and Istituto Nazionale di Fisica Nucleare, Sezione di Trieste, I-34013 Trieste, Italy*. (Received 20 February 1996)

We study the stability of the two-neutrino MSW solution of the solar neutrino problem, corresponding to solar ν_e transitions into a sterile neutrino, $\nu_e \rightarrow \nu_s$, with respect to changes of the total fluxes of ^8B and ^7Be neutrinos, Φ_B and Φ_{Be} . For any value of Φ_{Be} from the interval $0.7\Phi_{Be}^{BP} \leq \Phi_{Be} \leq 1.3\Phi_{Be}^{BP}$ the $\nu_e \rightarrow \nu_s$ MSW transitions provide at 95% C.L. a description of the existing solar neutrino data for $0.40\Phi_B^{BP} \leq \Phi_B \leq 36\Phi_B^{BP}$ and Φ_{Be}^{BP} being the fluxes in the solar model of Bahcall and Pinsonneault [Rev. Mod. Phys. **69**, 85 (1992)]. The corresponding allowed regions of values of the parameters Δm^2 and $\sin^2 2\theta$, characterizing the solar neutrino transitions, are derived. The physical implications of the found MSW $\nu_e \rightarrow \nu_s$ solutions for the future solar neutrino experiments are considered as well. [S0556-2821(96)03723-X] [Phys. Rev. D **54**, 7057 (1996)]

Domains of disoriented chiral condensates. R. D. Amado and Yang Lu, *Department of Physics, University of Pennsylvania, Philadelphia, Pennsylvania 19104*. (Received 6 August 1996)

The probability distribution of the neutral pion fraction from independent domains of disoriented chiral condensates is characterized. The signal for the condensate is clear for a small number of domains but is greatly reduced for more than three. [S0556-2821(96)02223-0] [Phys. Rev. D **54**, 7075 (1996)]