

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.

Equation of state for dense QCD and quark stars. Jens O. Andersen, *Institute for Theoretical Physics, University of Utrecht, Leuvenlaan 4, 3584 CE Utrecht, The Netherlands*; Michael Strickland, *Physics Department, Duke University, Durham, North Carolina 27701*. (Received 21 June 2002; published 5 November 2002)

We calculate the equation of state for degenerate quark matter to leading order in hard-dense-loop (HDL) perturbation theory. We solve the Tolman-Oppenheimer-Volkov equations to obtain the mass-radius relation for dense quark stars. Both the perturbative QCD and the HDL equations of state have a large variation with respect to the renormalization scale for $\mu \leq 1$ GeV which leads to large theoretical uncertainties in the quark star mass-radius relation. [Phys. Rev. D **66**, 105001 (2002)]

Modified Paschos-Wolfenstein relation and extraction of the weak mixing angle $\sin^2\theta_W$. S. Kumano, *Department of Physics, Saga University, Saga, 840-8502, Japan*. (Received 18 September 2002; published 26 December 2002)

The NuTeV Collaboration reported an anomalously large weak mixing angle $\sin^2\theta_W$ in comparison with the standard model prediction. Neutrino and antineutrino charged- and neutral-current events are analyzed for extracting $\sin^2\theta_W$. Although the Paschos-Wolfenstein relation is not directly used in the analysis, it plays an important role in the determination. Noting that the target nucleus, iron, is not an isoscalar nucleus, we derive a leading-order expression for a modified Paschos-Wolfenstein relation for nuclei, which may have neutron excess. Then, using charge and baryon-number conservations for nuclei, we discuss a nuclear correction in the $\sin^2\theta_W$ determination. It is noteworthy that nuclear modifications are different between valence up- and down-quark distributions. We show this difference effect on the NuTeV $\sin^2\theta_W$ deviation. [Phys. Rev. D **66**, 111301 (2002)]

Femtophotography of protons to nuclei with deeply virtual Compton scattering. John P. Ralston, *CPhT, École Polytechnique, F-91128 Palaiseau, France*, and *Department of Physics, University of Kansas, Lawrence, Kansas 66045*; Bernard Pire, *CPhT, École Polytechnique, F-91128 Palaiseau, France*. (Received 14 February 2002; published 26 December 2002)

Developments in deeply virtual Compton scattering allow the direct measurements of scattering amplitudes for exchange of a highly virtual photon with fine spatial resolution. Real-space images of the target can be obtained from this information. Spatial resolution is determined by the momentum transfer rather than the wavelength of the detected photon. Quantum photographs of the proton, nuclei, and other elementary particles with resolution on the scale

of a fraction of a femtometer are feasible with existing experimental technology. [Phys. Rev. D **66**, 111501 (2002)]

Solar neutrinos: Global analysis with day and night spectra from SNO. Pedro C. de Holanda, *The Abdus Salam International Centre for Theoretical Physics, I-34100 Trieste, Italy*; A. Yu. Smirnov, *The Abdus Salam International Centre for Theoretical Physics, I-34100 Trieste, Italy, and Institute for Nuclear Research of Russian Academy of Sciences, Moscow 117312, Russia*. (Received 22 July 2002; published 27 December 2002)

We perform global analysis of the solar neutrino data including the day and night spectra of events at SNO. In the context of two active neutrino mixing, the best fit of the data is provided by the large-mixing angle (LMA) Mikheyev-Smirnov-Wolfenstein solution with $\Delta m^2 = 6.15 \times 10^{-5} \text{ eV}^2$, $\tan^2\theta = 0.41$, $f_B = 1.05$, where f_B is the boron neutrino flux in units of the corresponding flux in the standard solar model (SSM). At the 3σ level we find the following upper bounds: $\tan^2\theta < 0.84$ and $\Delta m^2 < 3.6 \times 10^{-4} \text{ eV}^2$. From a 1σ interval we expect the day-night asymmetries of the charged current and electron scattering events to be $A_{\text{DN}}^{\text{CC}} = 3.9_{-2.9}^{+3.6}\%$ and $A_{\text{DN}}^{\text{ES}} = 2.1_{-1.4}^{+2.1}\%$. The only other solution which appears at the 3σ level is the VAC solution with $\Delta m^2 = 4.5 \times 10^{-10} \text{ eV}^2$, $\tan^2\theta = 2.1$, and $f_B = 0.75$. The best fit point in the low probability, low mass region, with $\Delta m^2 = 0.93 \times 10^{-7} \text{ eV}^2$ and $\tan^2\theta = 0.64$, is accepted at 99.95% (3.5σ) C.L. The least χ^2 point from the small mixing angle solution region, with $\Delta m^2 = 4.6 \times 10^{-6} \text{ eV}^2$ and $\tan^2\theta = 5 \times 10^{-4}$, could be accepted at the 5.5σ level only. In the three neutrino context the influence of θ_{13} is studied. We find that with an increase of θ_{13} the LMA best fit point shifts to a larger Δm^2 , the mixing angle is practically unchanged, and the quality of the fit becomes worse. The fits of LOW and SMA slightly improve. Predictions for the KamLAND experiment (total rates, spectrum distortion) have been calculated. [Phys. Rev. D **66**, 113005 (2002)]

When the transition temperature in color superconductors is not like in BCS theory. Andreas Schmitt, *Institut für Theoretische Physik, J. W. Goethe-Universität D-60054 Frankfurt/Main, Germany*; Qun Wang, *Institut für Theoretische Physik, J.W. Goethe-Universität, D-60054 Frankfurt/Main, Germany, and Physics Department, Shandong University, Jinan, Shandong, 250100, People's Republic of China*; Dirk H. Rischke, *Institut für Theoretische Physik, J.W. Goethe-Universität, D-60054 Frankfurt/Main, Germany*. (Received 19 September 2002; published 26 December 2002)

We study color superconductivity with $N_f = 1, 2$, and 3 massless flavors of quarks. We present a general formalism to derive and

solve the gap equations for condensation in the even-parity channel. This formalism shows that the leading-order contribution to the gap equation is unique for all color superconductors studied here, and that differences arise solely at the subleading order. We discuss a simple method to compute subleading contributions from the integration over gluon momenta in the gap equation. Subleading contributions enter the prefactor of the color-superconducting gap parameter. In the case of color-flavor and color-spin locking we identify further corrections to this prefactor arising from the two-gap structure of the quasiparticle excitations. Computing the transition temperature T_c , where the color-superconducting condensate melts, we find that these contributions lead to deviations from the BCS behavior $T_c \approx 0.57\phi_0$, where ϕ_0 is the magnitude of the zero-temperature gap at the Fermi surface. [Phys. Rev. D **66**, 114010 (2002)]

Absence of shadowing in Drell-Yan production at finite transverse momentum exchange. Stéphane Peigné, *LAPTH, B.P. 110, F-74941 Annecy-le-Vieux Cedex, France*. (Received 22 July 2002; published 27 December 2002)

Within a perturbative scalar QED model recently considered by Brodsky *et al.*, we study how leading-twist Coulomb rescatterings affect the Drell-Yan cross section at small $x = x_{\text{target}}$, and compare to the case of deep inelastic scattering at small x_B . We show that in the range where the transverse momentum transferred to the target is large compared to its minimal value $\sim \mathcal{O}(x)$, Coulomb rescatterings affect the DIS cross section but not the Drell-Yan production rate. This illustrates that the leading-twist parton distribution functions become nonuniversal when cross sections which are differential in target-related particles are considered. [Phys. Rev. D **66**, 114011 (2002)]

Second sheet σ pole and the threshold enhancement of the spectral function in the scalar-isoscalar meson sector. A. Patkós and Zs. Szép, *Department of Atomic Physics, Eötvös University, H-1117 Budapest, Hungary*; P. Szépfalusy, *Department of Physics of Complex Systems, Eötvös University, H-1117 Budapest, Hungary, and Research Institute for Solid State Physics and Optics, Hungarian Academy of Sciences, H-1525 Budapest, Hungary*. (Received 4 June 2002; published 18 December 2002)

The scalar-isoscalar propagator of the effective linear σ model of meson dynamics is investigated with the help of an expansion in the number of the Goldstone bosons. A generic scenario is suggested for the temperature or density driven evolution of its pole in the second Riemann sheet. An extended temperature range, correlated with characteristic pole locations, is found where the phenomenon of threshold enhancement takes place in the corresponding spectral function. [Phys. Rev. D **66**, 116004 (2002)]

Generalized Boltzmann equations for on-shell particle production in a hot plasma. A. Jakovác, *Theory Division, CERN, CH-1211 Geneva 23, Switzerland*. (Received 5 July 2002; published 11 December 2002)

A novel refinement of the conventional treatment of Kadanoff-Baym equations is suggested. In addition to the Boltzmann equation, another differential equation is used for calculating the evolution of the nonequilibrium two-point function. Although it was usually interpreted as a constraint on the solution of the Boltzmann equation, we argue that its dynamics is relevant to the determination and resummation of the particle production cut contributions. The differential equation for this new contribution is illustrated in the example of the cubic scalar model. The analogue of the relaxation time approximation is suggested. It results in the shift of the threshold location and in a smearing out of the nonanalytic threshold behavior of the spectral function. The possible consequences for the dilepton production are discussed. [Phys. Rev. D **66**, 125003 (2002)]