PHYSICAL REVIEW D™

For editorial and subscription correspondence,
please see inside front cover
(ISSN: 1550-7998)

PERIODICALS

Postmaster send address changes to:

APS Subscription Services
P.O. Box 41
Annapolis Junction, MD 20701

THIRD SERIES, VOLUME 91, NUMBER 9 *CONTENTS* D1 MAY 2015

RAPID COMMUNICATIONS

Measurement of central exclusive $\pi^+\pi^-$ production in $p\bar{p}$ collisions at $\sqrt{s} = 0.9$ and 1.96 TeV at CDF *(8 pages)* ..... 091101(R)
T. Aaltonen *et al.* (CDF Collaboration)

Consistent analysis of the $\nu_\mu \to \nu_e$ sterile neutrinos searches of ICARUS and OPERA *(6 pages)* ..... 091301(R)
Antonio Palazzo

ARTICLES

Parametric instability in long optical cavities and suppression by dynamic transverse mode frequency modulation *(8 pages)* 092001
Chunnong Zhao, Li Ju, Qi Fang, Carl Blair, Jiayi Qin, David Blair, Jerome Degallaix, and Hiroaki Yamamoto

First observation and amplitude analysis of the $B^- \to D^+K^-\pi^-$ decay *(24 pages)* 092002
R. Aaij *et al.* (LHCb Collaboration)

Search for Lorentz violation in short-range gravity *(6 pages)* 092003
J. C. Long and V. Alan Kostelecký

Dark matter effective field theory scattering in direct detection experiments *(13 pages)* 092004
K. Schneck *et al.* (SuperCDMS Collaboration)

Search for physics beyond the standard model in final states with a lepton and missing transverse energy in proton-proton collisions at $\sqrt{s} = 8$ TeV *(37 pages)* 092005
V. Khachatryan *et al.* (CMS Collaboration)

Measurements of $\psi(3686) \to K^-\Lambda\bar{\Xi}^+ + \text{c.c.}$ and $\psi(3686) \to \gamma K^-\Lambda\bar{\Xi}^+ + \text{c.c.}$ *(11 pages)* 092006
M. Ablikim *et al.* (BESIII Collaboration)

Measurement of scintillation and ionization yield and scintillation pulse shape from nuclear recoils in liquid argon *(29 pages)* 092007
H. Cao, T. Alexander, A. Aprahamian, R. Avetisyan, H. O. Back, A. G. Cocco, F. DeJongh, G. Fiorillo, C. Galbiati, L. Grandi, Y. Guardincerri, C. Kendziora, W. H. Lippincott, C. Love, S. Lyons, L. Manenti, C. J. Martoff, Y. Meng, D. Montanari, P. Mosteiro, D. Olvitt, S. Pordes, H. Qian, B. Rossi, R. Saldanha, S. Sangiorgio, K. Siegl, S. Y. Strauss, W. Tan, J. Tatarowicz, S. Walker, H. Wang, A. W. Watson, S. Westerdale, and J. Yoo (SCENE Collaboration)

Improved limit to the diffuse flux of ultrahigh energy neutrinos from the Pierre Auger Observatory *(14 pages)* 092008
A. Aab *et al.* (Pierre Auger Collaboration)

Measurement of $\mathcal{B}(\psi(3770) \to \gamma\chi_{c1})$ and search for $\psi(3770) \to \gamma\chi_{c2}$ *(9 pages)* 092009
M. Ablikim *et al.* (BESIII Collaboration)

Search for the $\eta' \to e^+e^-$ decay with the SND detector *(6 pages)* 092010
M. N. Achasov, V. M. Aulchenko, A. Yu. Barnyakov, K. I. Beloborodov, A. V. Berdyugin, D. E. Berkaev, A. G. Bogdanchikov, A. A. Botov, T. V. Dimova, V. P. Druzhinin, V. B. Golubev, L. V. Kardapoltsev, A. S. Kasaev, A. G. Kharlamov, A. N. Kirpotin, D. P. Kovrizhin, I. A. Koop, A. A. Korol, S. V. Koshuba, A. S. Kupich, K. A. Martin, N. Yu. Muchnoi, A. E. Obrazovsky, A. V. Otboev, E. V. Pakhtusova, A. I. Senchenko, S. I. Serednyakov, P. Yu. Shatunov, Yu. M. Shatunov, D. A. Shtol, D. B. Shwartz, Z. K. Silagadze, I. K. Surin, Yu. A. Tikhonov, Yu. V. Usov, A. V. Vasiljev, and I. M. Zemlyansky (SND Collaboration)

Copyright 2015 American Physical Society

(Continued)

1550-7998(20150501)91:9;1-2

Selected for a Viewpoint in *Physics*. Please visit http://physics.aps.org/.
By suggesting a few manuscripts each week, we hope to promote reading across fields. Please see our Announcement Phys. Rev. D **90**, 010001 (2014).

PHYSICAL REVIEW D THIRD SERIES, VOLUME 91, NUMBER 9 D1 MAY 2015

Measurements of $B \to \bar{D}D_{s0}^{*+}(2317)$ decay rates and a search for isospin partners of the $D_{s0}^{*+}(2317)$ *(12 pages)* 092011
S.-K. Choi *et al.* (The Belle Collaboration)

Study of final-state radiation in decays of Z bosons produced in pp collisions at 7 TeV *(24 pages)* 092012
V. Khachatryan *et al.* (CMS Collaboration)

Low-energy photon production in neutrino neutral-current interactions *(4 pages)* 093001
Jonathan L. Rosner

Specific supersimple properties of $e^-e^+ \to \gamma H$ at high energy *(22 pages)* 093002
G. J. Gounaris and F. M. Renard

Signatures of the quintuplet leptons at the LHC *(11 pages)* 093003
You Yu, Chong-Xing Yue, and Shuo Yang

Relativistic Green's function model and charged-current inclusive neutrino-nucleus scattering at T2K kinematics *(6 pages)* 093004
Andrea Meucci and Carlotta Giusti

CP-odd contributions to the $ZZ^*\gamma$, $ZZ\gamma^*$, and ZZZ^* vertices induced by nondiagonal charged scalar boson couplings *(11 pages)* 093005
A. Moyotl, G. Tavares-Velasco, and J. J. Toscano

LHC phenomenology of the type II seesaw mechanism: Nondegenerate case *(27 pages)* 093006
Zhi-Long Han, Ran Ding, and Yi Liao

Upper limit on the scale of new physics phenomena from rising cross sections in high multiplicity Higgs and vector boson events *(11 pages)* 093007
Joerg Jaeckel and Valentin V. Khoze

Improved bounds on the dipole moments of the tau neutrino from high-energy γ^*e^- and $\gamma^*\gamma^*$ collisions at the ILC and CLIC *(13 pages)* 093008
A. Gutiérrez-Rodríguez, M. Koksal, and A. A. Billur

Constrained flavor breaking *(9 pages)* 093009
Thomas Appelquist, Yang Bai, and Maurizio Piai

Multilepton and lepton jet probes of sub-weak-scale right-handed neutrinos *(12 pages)* 093010
Eder Izaguirre and Brian Shuve

Dark matter origins of neutrino masses *(5 pages)* 093011
Wei-Chih Huang and Frank F. Deppisch

Radiative transition of negative to positive parity nucleon *(9 pages)* 093012
K. Azizi and H. Sundu

Covariant expansion of the gravitational Stückelberg trick *(7 pages)* 094001
Xian Gao

Determination of strange sea quark distributions from fixed-target and collider data *(16 pages)* 094002
S. Alekhin, J. Blümlein, L. Caminada, K. Lipka, K. Lohwasser, S. Moch, R. Petti, and R. Plačakytė

Higgs boson production in association with top quarks in the POWHEG BOX *(8 pages)* 094003
H. B. Hartanto, B. Jäger, L. Reina, and D. Wackeroth

Spectrum of higher excitations of B and D mesons in the relativistic potential model *(15 pages)* 094004
Jing-Bin Liu and Mao-Zhi Yang

Automated next-to-leading order predictions for new physics at the LHC: The case of colored scalar pair production *(5 pages)* 094005
Céline Degrande, Benjamin Fuks, Valentin Hirschi, Josselin Proudom, and Hua-Sheng Shao

QCD description of backward vector meson hard electroproduction *(19 pages)* 094006
B. Pire, K. Semenov-Tian-Shansky, and L. Szymanowski

Equal-velocity scenario for hiding dark matter at the LHC *(9 pages)* 094007
Kaoru Hagiwara and Toshifumi Yamada

Study of the KN-K^*N coupled system in s-wave *(13 pages)* 094008
K. P. Khemchandani, A. Martínez Torres, F. S. Navarra, M. Nielsen, and L. Tolos

Discerning new physics in charm meson leptonic and semileptonic decays *(9 pages)* 094009
Svjetlana Fajfer, Ivan Nišandžić, and Urša Rojec

Quark flavor distribution functions for the octet baryons in the chiral quark constituent model *(11 pages)* 094010
Harleen Dahiya

(Continued)



Selected for a Viewpoint in *Physics*. Please visit http://physics.aps.org/.
By suggesting a few manuscripts each week, we hope to promote reading across fields. Please see our Announcement Phys. Rev. D **90**, 010001 (2014).

PHYSICAL REVIEW D **THIRD SERIES, VOLUME 91, NUMBER 9** **D1 MAY 2015**

Rapidity divergences and deep inelastic scattering in the endpoint region *(11 pages)* 094011
Sean Fleming and Ou Z. Labun

Medium effects on the relaxation of dissipative flows in a hot pion gas *(11 pages)* 094012
Sukanya Mitra, Utsab Gangopadhyaya, and Sourav Sarkar

Study of the $f_2(1270)$, $f_2'(1525)$, $\bar{K}_2^*(1430)$, $f_0(1370)$ and $f_0(1710)$ production from $\psi(nS)$ and $\Upsilon(nS)$ decays *(6 pages)* 094013
Lian-Rong Dai, Ju-Jun Xie, and Eulogio Oset

η_c production in photon-induced interactions at a fixed target experiment at LHC as a probe of the odderon *(6 pages)* 094014
V. P. Gonçalves and W. K. Sauter

Nature of the $a_1(1420)$ *(14 pages)* 094015
M. Mikhasenko, B. Ketzer, and A. Sarantsev

Single inclusive particle production in proton-nucleus collisions at next-to-leading order in the hybrid formalism *(41 pages)* 094016
Tolga Altinoluk, Néstor Armesto, Guillaume Beuf, Alex Kovner, and Michael Lublinsky

C-parameter distribution at N^3LL' including power corrections *(35 pages)* 094017
André H. Hoang, Daniel W. Kolodrubetz, Vicent Mateu, and Iain W. Stewart

Precise determination of α_s from the *C*-parameter distribution *(24 pages)* 094018
André H. Hoang, Daniel W. Kolodrubetz, Vicent Mateu, and Iain W. Stewart

Scalar leptoquarks and the rare *B* meson decays *(14 pages)* 094019
Suchismita Sahoo and Rukmani Mohanta

Charmed-strange meson spectrum: Old and new problems *(10 pages)* 094020
Jorge Segovia, David R. Entem, and Francisco Fernández

Pinning down top dipole moments with ultraboosted tops *(8 pages)* 094021
Juan A. Aguilar-Saavedra, Benjamin Fuks, and Michelangelo L. Mangano

$a_1(1420)$ resonance as a tetraquark state and its isospin partner *(13 pages)* 094022
Hua-Xing Chen, Er-Liang Cui, Wei Chen, T. G. Steele, Xiang Liu, and Shi-Lin Zhu

Observation of $e^+e^- \to \chi_{c0}\omega$ and missing higher charmonium $\psi(4S)$ *(9 pages)* 094023
Dian-Yong Chen, Xiang Liu, and Takayuki Matsuki

S-wave resonance contributions to the $B^0_{(s)} \to J/\psi\pi^+\pi^-$ and $B_s \to \pi^+\pi^-\mu^+\mu^-$ decays *(12 pages)* 094024
Wen-Fei Wang, Hsiang-nan Li, Wei Wang, and Cai-Dian Lü

Tetraquark cusp effects from diquark pair production *(12 pages)* 094025
Samuel H. Blitz and Richard F. Lebed

Testing GeV-scale dark matter with fixed-target missing momentum experiments *(17 pages)* 094026
Eder Izaguirre, Gordan Krnjaic, Philip Schuster, and Natalia Toro

Removing phase-space restrictions in factorized cross sections *(19 pages)* 094027
Ilya Feige, Matthew D. Schwartz, and Kai Yan

Setting the renormalization scale in perturbative QCD: Comparisons of the principle of maximum conformality with the sequential extended Brodsky-Lepage-Mackenzie approach *(16 pages)* 094028
Hong-Hao Ma, Xing-Gang Wu, Yang Ma, Stanley J. Brodsky, and Matin Mojaza

Dispersive analysis of $\omega/\phi \to 3\pi, \pi\gamma^*$ *(14 pages)* 094029
I. V. Danilkin, C. Fernández-Ramírez, P. Guo, V. Mathieu, D. Schott, M. Shi, and A. P. Szczepaniak

Masses and axial currents of the doubly charmed baryons *(12 pages)* 094030
Zhi-Feng Sun, Zhan-Wei Liu, Xiang Liu, and Shi-Lin Zhu

NLO QCD corrections for χ_{cJ} inclusive production at *B* factories *(7 pages)* 094031
Long-Bin Chen, Jun Jiang, and Cong-Feng Qiao

Measuring *CP* violation and mixing in charm with inclusive self-conjugate multibody decay modes *(5 pages)* 094032
S. Malde, C. Thomas, and G. Wilkinson

Single-spin asymmetries in *W* boson production at next-to-leading order *(13 pages)* 094033
Felix Ringer and Werner Vogelsang

$1/m$ corrections for orbitally excited heavy mesons and the 1/2–3/2 puzzle *(9 pages)* 094034
Rebecca Klein, Thomas Mannel, Farnoush Shahriaran, and Danny van Dyk

N-jettiness soft function at next-to-next-to-leading order *(12 pages)* 094035
Radja Boughezal, Xiaohui Liu, and Frank Petriello

(Continued)

Selected for a Viewpoint in *Physics*. Please visit http://physics.aps.org/.
By suggesting a few manuscripts each week, we hope to promote reading across fields. Please see our Announcement Phys. Rev. D **90**, 010001 (2014).

PHYSICAL REVIEW D **THIRD SERIES, VOLUME 91, NUMBER 9** **D1 MAY 2015**

Partial restoration of chiral symmetry in the color flux tube *(10 pages)* 094501
Takumi Iritani, Guido Cossu, and Shoji Hashimoto

Spectroscopy of doubly charmed baryons from lattice QCD *(17 pages)* 094502
M. Padmanath, Robert G. Edwards, Nilmani Mathur, and Michael Peardon (Hadron Spectrum Collaboration)

Strangeness of the nucleon from lattice QCD *(6 pages)* 094503
Constantia Alexandrou, Martha Constantinou, Simon Dinter, Vincent Drach, Kyriakos Hadjiyiannakou, Karl Jansen, Giannis Koutsou, and Alejandro Vaquero (ETM Collaboration)

Microscopic origin of $U_A(1)$ symmetry violation in the high temperature phase of QCD *(15 pages)* 094504
Viktor Dick, Frithjof Karsch, Edwin Laermann, Swagato Mukherjee, and Sayantan Sharma

$K\pi$ interaction in finite volume and the K^* resonance *(11 pages)* 094505
Dan Zhou, Er-Liang Cui, Hua-Xing Chen, Li-Sheng Geng, and Li-Hua Zhu

Top quark induced effective potential in a composite Higgs model *(17 pages)* 094506
Maarten Golterman and Yigal Shamir

Lee-Yang zero distribution of high temperature QCD and the Roberge-Weiss phase transition *(12 pages)* 094507
Keitaro Nagata, Kouji Kashiwa, Atsushi Nakamura, and Shinsuke M. Nishigaki

Lattice QCD study of four-quark components of the isosinglet scalar mesons: Significance of disconnected diagrams *(10 pages)* 094508
Masayuki Wakayama, Teiji Kunihiro, Shin Muroya, Atsushi Nakamura, Chiho Nonaka, Motoo Sekiguchi, and Hiroaki Wada (SCALAR Collaboration)

Lattice baryon spectroscopy with multiparticle interpolators *(13 pages)* 094509
Adrian L. Kiratidis, Waseem Kamleh, Derek B. Leinweber, and Benjamin J. Owen

Chiral corrections to nucleon two- and three-point correlation functions *(11 pages)* 094510
Brian C. Tiburzi

Matrix elements of $\Delta B = 0$ operators in heavy hadron chiral perturbation theory *(19 pages)* 094511
Jong-Wan Lee

Gluonic profile of the static baryon at finite temperature *(19 pages)* 094512
Ahmed S. Bakry, Derek B. Leinweber, and Anthony G. Williams

Theory for baryon number and dark matter at the LHC *(15 pages)* 095001
Michael Duerr and Pavel Fileviez Pérez

Higgs phenomenology in the stealth doublet model *(25 pages)* 095002
Rikard Enberg, Johan Rathsman, and Glenn Wouda

NMSSM explanations of the Galactic center gamma ray excess and promising LHC searches *(17 pages)* 095003
Jun Guo, Jinmian Li, Tianjun Li, and Anthony G. Williams

Discrimination of dark matter models in future experiments *(19 pages)* 095004
Tomohiro Abe, Ryuichiro Kitano, and Ryosuke Sato

GUT-inspired supersymmetric model for $h \to \gamma\gamma$ and the muon $g-2$ *(10 pages)* 095005
M. Adeel Ajaib, Ilia Gogoladze, and Qaisar Shafi

Revisiting multicomponent dark matter with new AMS-02 data *(9 pages)* 095006
Chao-Qiang Geng, Da Huang, and Chang Lai

Constraints on a seesaw model leading to quasidegenerate neutrinos and signatures at the LHC *(11 pages)* 095007
Gulab Bambhaniya, Subrata Khan, Partha Konar, and Tanmoy Mondal

Exclusive production of heavy charged Higgs boson pairs in the $pp \to ppH^+H^-$ reaction at the LHC and a future circular collider *(16 pages)* 095008
Piotr Lebiedowicz and Antoni Szczurek

Stealth QCD-like strong interactions and the $t\bar{t}$ asymmetry *(25 pages)* 095009
Joachim Brod, Jure Drobnak, Alexander L. Kagan, Emmanuel Stamou, and Jure Zupan

Dark matter and gauge coupling unification in nonsupersymmetric SO(10) grand unified models *(23 pages)* 095010
Yann Mambrini, Natsumi Nagata, Keith A. Olive, Jérémie Quevillon, and Jiaming Zheng

Enhancement of $\mathrm{Br}(B_d \to \mu^+\mu^-)/\mathrm{Br}(B_s \to \mu^+\mu^-)$ in supersymmetric unified models *(7 pages)* 095011
Bhaskar Dutta and Yukihiro Mimura

Twin Higgs mechanism and a composite Higgs boson *(16 pages)* 095012
Matthew Low, Andrea Tesi, and Lian-Tao Wang

(Continued)



Selected for a Viewpoint in *Physics*. Please visit http://physics.aps.org/.
By suggesting a few manuscripts each week, we hope to promote reading across fields. Please see our Announcement Phys. Rev. D **90**, 010001 (2014).

PHYSICAL REVIEW D THIRD SERIES, VOLUME 91, NUMBER 9 D1 MAY 2015

Unitarity in composite Higgs boson approaches with vector resonances *(18 pages)* 095013
Daniele Barducci, Haiying Cai, Stefania De Curtis, Felipe J. Llanes-Estrada, and Stefano Moretti

Precision measurements constraints on the number of Higgs doublets *(13 pages)* 095014
A. E. Cárcamo Hernández, Sergey Kovalenko, and Iván Schmidt

Muon $g-2$ and searches for a new leptophobic sub-GeV dark boson in a missing-energy experiment at CERN *(12 pages)* 095015
S. N. Gninenko, N. V. Krasnikov, and V. A. Matveev

Consistency of the recent ATLAS $Z+E_T^{\mathrm{miss}}$ excess in a simplified general gauge mediation model *(7 pages)* 095016
Ben Allanach, Are Raklev, and Anders Kvellestad

Neutron electric dipole moment and probe of PeV scale physics *(14 pages)* 095017
Amin Aboubrahim, Tarek Ibrahim, and Pran Nath

Anatomy of coannihilation with a scalar top partner *(16 pages)* 095018
A. Ibarra, A. Pierce, N. R. Shah, and S. Vogl

CP-odd component of the lightest neutral Higgs boson in the MSSM *(16 pages)* 095019
Bing Li and Carlos E. M. Wagner

Searches for dark matter signals in simplified models at future hadron colliders *(13 pages)* 095020
Qian-Fei Xiang, Xiao-Jun Bi, Peng-Fei Yin, and Zhao-Huan Yu

Elementary Goldstone Higgs boson and dark matter *(13 pages)* 095021
Tommi Alanne, Helene Gertov, Francesco Sannino, and Kimmo Tuominen

Higgs boson mass and high-luminosity LHC probes of supersymmetry with vectorlike top quark *(9 pages)* 095022
Zygmunt Lalak, Marek Lewicki, and James D. Wells

Solar neutrino physics with low-threshold dark matter detectors *(13 pages)* 095023
J. Billard, L. E. Strigari, and E. Figueroa-Feliciano

Search for a stable alignment limit in two-Higgs-doublet models *(13 pages)* 095024
Dipankar Das and Ipsita Saha

Nonthermal *CP* violation in soft leptogenesis *(14 pages)* 096001
Rathin Adhikari, Arnab Dasgupta, Chee Sheng Fong, and Raghavan Rangarajan

Critical point and scale setting in SU(3) plasma: An update *(7 pages)* 096002
A. Francis, O. Kaczmarek, M. Laine, T. Neuhaus, and H. Ohno

Mixing angle as a function of neutrino mass ratio *(8 pages)* 096003
S. Roy and N. N. Singh

Dynamical flavor origin of $\mathbb{Z}_N$ symmetries *(6 pages)* 096004
D. Aristizabal Sierra, Mikaël Dhen, Chee Sheng Fong, and Avelino Vicente

Yukawa unification and sparticle spectroscopy in gauge mediation models *(10 pages)* 096005
Ilia Gogoladze, Azar Mustafayev, Qaisar Shafi, and Cem Salih Ün

Radiated power and radiation reaction forces of coherently oscillating charged particles in classical electrodynamics *(14 pages)* 096006
Pardis Niknejadi, John M. J. Madey, and Jeremy M. D. Kowalczyk

High-energy vector boson scattering after the Higgs boson discovery *(23 pages)* 096007
Wolfgang Kilian, Marco Sekulla, Thorsten Ohl, and Jürgen Reuter

Refined applications of the collapse of the wave function *(13 pages)* 096008
L. Stodolsky

Limiting Lorentz violation from neutron-antineutron oscillation *(5 pages)* 096009
K. S. Babu and Rabindra N. Mohapatra

Phenomenology of n-$\bar{n}$ oscillations revisited *(7 pages)* 096010
S. Gardner and E. Jafari

Inhomogeneous quark condensate in compressed Skyrmion matter *(6 pages)* 096011
Masayasu Harada, Hyun Kyu Lee, Yong-Liang Ma, and Mannque Rho

Natural millicharged inflation *(5 pages)* 096012
Yang Bai and Ben. A. Stefanek

(Continued)



Selected for a Viewpoint in *Physics*. Please visit http://physics.aps.org/.
By suggesting a few manuscripts each week, we hope to promote reading across fields. Please see our Announcement Phys. Rev. D **90**, 010001 (2014).

PHYSICAL REVIEW D THIRD SERIES, VOLUME 91, NUMBER 9 D1 MAY 2015

ERRATA

Erratum: Decay constants of heavy-light vector mesons from QCD sum rules [Phys. Rev. D **88**, 014015 (2013)] *(1 pages)* 099901
P. Gelhausen, A. Khodjamirian, A. A. Pivovarov, and D. Rosenthal

Erratum: Constraining τ-lepton dipole moments and gluon couplings at the LHC [Phys. Rev. D **88**, 013015 (2013)] *(2 pages)* 099902
Alper Hayreter and German Valencia

Selected for a Viewpoint in *Physics*. Please visit http://physics.aps.org/.
By suggesting a few manuscripts each week, we hope to promote reading across fields. Please see our Announcement Phys. Rev. D **90**, 010001 (2014).