# PHYSICAL REVIEW C

**For editorial and subscription correspondence, please see inside front cover**
**(ISSN: 0556-2813)**

**PERIODICALS**
**Postmaster send address changes to:**
**American Institute of Physics**
**Suite 1NO1**
**2 Huntington Quadrangle**
**Melville, NY 11747-4502**

**THIRD SERIES, VOLUME 66, NUMBER 5** ***CONTENTS*** **NOVEMBER 2002**

## RAPID COMMUNICATIONS

Evidence for a $1g_{9/2}$ rotational band in $^{51}$Mn *(5 pages)* . . . . . 051301(R)
J. Ekman, D. Rudolph, C. Fahlander, I. Ragnarsson, C. Andreoiu, M. A. Bentley, M. P. Carpenter, R. J. Charity, R. M. Clark, M. Cromaz, P. Fallon, E. Ideguchi, A. O. Macchiavelli, M. N. Mineva, W. Reviol, D. G. Sarantites, D. Seweryniak, V. Tomov, and S. J. Williams

Nuclear level densities within the relativistic mean-field theory *(4 pages)* . . . . . 051302(R)
B. Nerlo-Pomorska, K. Pomorski, J. Bartel, and K. Dietrich

Fully renormalized quasiparticle random-phase approximation fulfills Ikeda sum rule exactly *(4 pages)* . . . . . 051303(R)
Vadim Rodin and Amand Faessler

Mirror displacement energies and neutron skins *(5 pages)* . . . . . 051304(R)
J. Duflo and A. P. Zuker

New $0^+$ states in $^{158}$Gd *(4 pages)* . . . . . 051305(R)
S. R. Lesher, A. Aprahamian, L. Trache, A. Oros-Peusquens, S. Deyliz, A. Gollwitzer, R. Hertenberger, B. D. Valnion, and G. Graw

Quadrupole and octupole softness in the $N=Z$ nucleus $^{64}$Ge *(4 pages)* . . . . . 051306(R)
Kazunari Kaneko, Munetake Hasegawa, and Takahiro Mizusaki

Population of the 168-keV ($g_{7/2}$) excited state in $^{103}$Sn in the $\alpha$ decay of $^{107}$Te *(3 pages)* . . . . . 051307(R)
D. Seweryniak, W. B. Walters, A. Woehr, M. Lipoglavsek, J. Shergur, C. N. Davids, A. Heinz, and J. J. Ressler

Critical temperature of nuclear matter and fragment distributions in multifragmentation of finite nuclei *(5 pages)* . . . . . 051601(R)
R. Ogul and A. S. Botvina

## ARTICLES

### Nucleon-Nucleon Interaction, Few-Body Systems

Indications for the nonexistence of three-neutron resonances near the physical region *(9 pages)* . . . . . 054001
A. Hemmdan, W. Glöckle, and H. Kamada

Toy model for pion production in nucleon-nucleon collisions. II. The role of three-particle singularities *(8 pages)* . . . . . 054002
A. Motzke, Ch. Elster, and C. Hanhart

Theoretical study of $^3$He$(\mu^-,\nu_\mu)^3$H capture *(10 pages)* . . . . . 054003
L. E. Marcucci, R. Schiavilla, S. Rosati, A. Kievsky, and M. Viviani

Two-body electrodisintegration of the three-nucleon bound state with $\Delta$-isobar excitation *(14 pages)* . . . . . 054004
L. P. Yuan, K. Chmielewski, M. Oelsner, P. U. Sauer, and J. Adam, Jr.

Complete next-to-leading-order calculation for pion production in nucleon-nucleon collisions at threshold *(5 pages)* . . . . . 054005
C. Hanhart and N. Kaiser

**Copyright 2002 by The American Physical Society**

*(Continued)*

0556-2813(200211)66:5;1-P

**PHYSICAL REVIEW C** **THIRD SERIES, VOLUME 66, NUMBER 5** **NOVEMBER 2002**

Elastic scattering of charged pions from $^{3}$H and $^{3}$He *(6 pages)* . . . . . 054006
W. J. Briscoe, B. L. Berman, R. W. C. Carter, K. S. Dhuga, S. K. Matthews, N-J. Nicholas, S. J. Greene, B. M. K. Nefkens, J. W. Price, L. D. Isenhower, M. E. Sadler, I. Šlaus, and I. Supek

Charge-symmetry violation in pion scattering from three-body nuclei *(18 pages)* . . . . . 054007
A. E. Kudryavtsev, V. E. Tarasov, B. L. Berman, W. J. Briscoe, K. S. Dhuga, and I. I. Strakovsky

**Nuclear Structure**

Shell-model calculations for $^{16}_{\Lambda}$O and $^{17}_{\Lambda}$O using microscopic effective interactions with $\Sigma$ degrees of freedom *(10 pages)* . . . . . 054301
Shinichiro Fujii, Ryoji Okamoto, and Kenji Suzuki

Shape evolution in heavy sulfur isotopes and erosion of the $N=28$ shell closure *(7 pages)* . . . . . 054302
D. Sohler, Zs. Dombrádi, J. Timár, O. Sorlin, F. Azaiez, F. Amorini, M. Belleguic, C. Bourgeois, C. Donzaud, J. Duprat, D. Guillemaud-Mueller, F. Ibrahim, J. A. Scarpaci, M. Stanoiu, M. J. Lopez, M. G. Saint-Laurent, F. Becker, F. Sarazin, C. Stodel, G. Voltolini, S. M. Lukyanov, V. Maslov, Yu.-E. Penionzhkevich, M. Girod, S. Péru, F. Nowacki, G. Sletten, R. Lucas, C. Theisen, D. Baiborodin, Z. Dlouhy, J. Mrazek, C. Borcea, A. Bauchet, C. J. Moore, and M. J. Taylor

$1g_{9/2}$, $1f_{5/2}$, and $1f_{7/2}$ neutron inner hole responses in $^{115}$Sn and $^{119}$Sn via the $(\vec{d},t)$ reaction at $E_d=200$ MeV *(14 pages)* . . . . . 054303
H. Langevin-Joliot, J. Van de Wiele, J. Guillot, E. Gerlic, L. H. Rosier, A. Willis, C. Djalali, M. Morlet, E. Tomasi-Gustafsson, N. Blasi, S. Micheletti, and S. Y. van der Werf

Self-energy effects on isospin singlet pairing in nuclear matter *(5 pages)* . . . . . 054304
M. Baldo, U. Lombardo, H.-J. Schulze, and Zuo Wei

Evolution of collectivity with spin in $^{81}$Y *(13 pages)* . . . . . 054305
R. A. Kaye, C. T. Rastovski, S. L. Tabor, J. Döring, F. Cristancho, M. Devlin, G. D. Johns, I. Y. Lee, F. Lerma, A. O. Macchiavelli, D. G. Sarantites, and G. Z. Solomon

Rotationally invariant Hamiltonians for nuclear spectra based on quantum algebras *(21 pages)* . . . . . 054306
Dennis Bonatsos, B. A. Kotsos, P. P. Raychev, and P. A. Terziev

Hypernuclear Auger effect within density dependent relativistic hadron field theory *(9 pages)* . . . . . 054307
Christoph Keil and Horst Lenske

Improved variational calculations of nucleon matter *(13 pages)* . . . . . 054308
J. Morales, Jr., V. R. Pandharipande, and D. G. Ravenhall

Persistence of $K$ isomerism in the $N=104$ isotones: Observation of a high-seniority isomer in $^{179}_{75}$Re *(22 pages)* . . . . . 054309
C. Thwaites, C. Wheldon, A. M. Bruce, P. M. Walker, G. D. Dracoulis, A. P. Byrne, T. Kibédi, F. G. Kondev, C. J. Pearson, and C. S. Purry

Low-spin structure of $^{156}$Dy through $\gamma$-ray spectroscopy *(19 pages)* . . . . . 054310
M. A. Caprio, N. V. Zamfir, R. F. Casten, C. J. Barton, C. W. Beausang, J. R. Cooper, A. A. Hecht, R. Krücken, H. Newman, J. R. Novak, N. Pietralla, A. Wolf, and K. E. Zyromski

Yrast spectroscopy in the neutron-deficient nucleus $^{169}$Os *(6 pages)* . . . . . 054311
D. T. Joss, J. Simpson, R. D. Page, S. L. King, N. Amzal, D. E. Appelbe, T. Bäck, M. A. Bentley, B. Cederwall, J. F. C. Cocks, D. M. Cullen, P. T. Greenlees, K. Helariutta, P. M. Jones, R. Julin, S. Juutinen, H. Kankaanpää, A. Keenan, H. Kettunen, P. Kuusiniemi, M. Leino, M. Muikku, A. Savelius, J. Uusitalo, D. D. Warner, S. J. Williams, and R. Wyss

Finite size effect on the strength function in a random matrix analysis *(6 pages)* . . . . . 054312
Jianzhong Gu, Lei Gao, and Bambi Hu

Anomalous behavior of $2^{+}$ excitations around $^{132}$Sn *(8 pages)* . . . . . 054313
J. Terasaki, J. Engel, W. Nazarewicz, and M. Stoitsov

*(Continued)*

**PHYSICAL REVIEW C** **THIRD SERIES, VOLUME 66, NUMBER 5** **NOVEMBER 2002**

**Nuclear Reactions**

Spin polarization of $^{27}$Na and $^{31}$Al in intermediate energy projectile fragmentation of $^{36}$S *(7 pages)* . . . . . 054601

D. Borremans, J. M. Daugas, S. Teughels, D. L. Balabanski, N. Coulier, F. de Oliveira Santos, G. Georgiev, M. Hass, M. Lewitowicz, I. Matea, Yu. E. Penionzhkevich, W.-D. Schmidt-Ott, Yu. E. Sobolev, M. Stanoiu, K. Vyvey, and G. Neyens

Model-independent spin-parity determination by the $(d, ^2\mathrm{He})$ reaction and possible evidence for a $0^-$ state in $^{12}$B *(4 pages)* . . . . . 054602

H. Okamura, T. Uesaka, K. Suda, H. Kumasaka, R. Suzuki, A. Tamii, N. Sakamoto, and H. Sakai

Pion single-charge-exchange reactions above the $\Delta$ resonance *(5 pages)* . . . . . 054603

Naoko Nose-Togawa and Kenji Kume

Resonance lifetime in Boltzmann-Uehling-Uhlenbeck theory: Observable consequences *(4 pages)* . . . . . 054604

A. B. Larionov, M. Effenberger, S. Leupold, and U. Mosel

Neutron activation measurements on natural tellurium *(9 pages)* . . . . . 054605

R. Reifarth and F. Käppeler

Semiexclusive pionic double charge exchange on $^4$He *(6 pages)* . . . . . 054606

J. L. Clark, M. E. Sevior, H. Clement, J. Gräter, R. Meier, G. J. Wagner, P.-A. Amaudruz, L. Felawka, G. J. Hofman, D. Ottewell, G. R. Smith, A. Ambardar, M. Kermani, G. Tagliente, P. Camerini, E. Fragiacomo, N. Grion, R. Rui, E. L. Mathie, R. Tacik, D. M. Yeomans, E. F. Gibson, J. T. Brack, and M. Schepkin

Comparison between $\alpha$ and proton sequential emission in $^{16}$O(132 MeV)$+^{58}$Ni deep inelastic collisions *(12 pages)* . . . . . 054607

R. Barná, D. De Pasquale, A. Italiano, A. Trifiró, M. Trimarchi, V. Rauch, C. Beck, T. Bellot, C. Bhattacharya, D. Disdier, R. M. Freeman, F. Haas, R. Nouicer, P. Papka, M. Rousseau, O. Stezowski, and A. Strazzeri

**Relativistic Nuclear Collisions**

Proton emission in Au+Au collisions at 6, 8, and 10.8 GeV/nucleon *(10 pages)* . . . . . 054901

B. B. Back, R. R. Betts, J. Chang, W. C. Chang, C. Y. Chi, Y. Y. Chu, J. B. Cumming, J. C. Dunlop, W. Eldredge, S. Y. Fung, R. Ganz, E. Garcia, A. Gillitzer, G. Heintzelman, W. F. Henning, D. J. Hofman, B. Holzman, J. H. Kang, E. J. Kim, S. Y. Kim, Y. Kwon, D. McLeod, A. C. Mignerey, M. Moulson, V. Nanal, C. A. Ogilvie, R. Pak, A. Ruangma, D. E. Russ, R. K. Seto, P. J. Stanskas, G. S. F. Stephans, H. Q. Wang, F. L. H. Wolfs, A. H. Wuosmaa, H. Xiang, G. H. Xu, H. B. Yao, and C. M. Zou (E917 Collaboration)

*(Continued)*

**PHYSICAL REVIEW C** **THIRD SERIES, VOLUME 66, NUMBER 5** **NOVEMBER 2002**

Energy dependence of pion and kaon production in central Pb+Pb collisions *(9 pages)* . . . . . 054902
S. V. Afanasiev, T. Anticic, D. Barna, J. Bartke, R. A. Barton, M. Behler, L. Betev, H. Białkowska, A. Billmeier, C. Blume, C. O. Blyth, B. Boimska, M. Botje, J. Bracinik, R. Bramm, R. Brun, P. Bunčić, V. Cerny, J. G. Cramer, P. Csató, P. Dinkelaker, V. Eckhardt, P. Filip, Z. Fodor, P. Foka, P. Freund, V. Friese, J. Gál, M. Gaździcki, G. Georgopoulos, E. Gładysz, S. Hegyi, C. Höhne, G. Igo, P. G. Jones, K. Kadija, A. Karev, V. I. Kolesnikov, T. Kollegger, M. Kowalski, I. Kraus, M. Kreps, M. van Leeuwen, P. Lévai, A. I. Malakhov, S. Margetis, C. Markert, B. W. Mayes, G. L. Melkumov, A. Mischke, J. Molnár, J. M. Nelson, G. Pálla, A. D. Panagiotou, K. Perl, A. Petridis, M. Pikna, L. Pinsky, F. Pühlhofer, J. G. Reid, R. Renfordt, W. Retyk, C. Roland, G. Roland, A. Rybicki, T. Sammer, A. Sandoval, H. Sann, N. Schmitz, P. Seyboth, F. Sikléer, B. Sitar, E. Skrzypczak, G. T. A. Squier, R. Stock, H. Ströbele, T. Susa, I. Szentpétery, J. Sziklai, T. A. Trainor, D. Varga, M. Vassiliou, G. I. Veres, G. Vesztergombi, D. Vranić, A. Wetzler, C. Whitten, I. K. Yoo, J. Zaranek, and J. Zimányi (The NA49 Collaboration)

Baryon stopping and strange baryon and antibaryon production at ultrarelativistic energies *(5 pages)* . . . . . 054903
H. Weber, E. L. Bratkovskaya, and H. Stöcker

Comparison of space-time evolutions of hot, dense matter in $\sqrt{s_{NN}}=17$ and 130 GeV relativistic heavy ion collisions based on a hydrodynamical model *(10 pages)* . . . . . 054904
Kenji Morita, Shin Muroya, Chiho Nonaka, and Tetsufumi Hirano

Collective flow and two-pion correlations from a relativistic hydrodynamic model with early chemical freeze-out *(14 pages)* . . . . . 054905
Tetsufumi Hirano and Keiichi Tsuda

System, centrality, and transverse mass dependence of two-pion correlation radii in heavy ion collisions at 11.6*A* and 14.6*A* GeV/*c* *(15 pages)* . . . . . 054906
L. Ahle, Y. Akiba, K. Ashktorab, M. D. Baker, D. Beavis, P. Beery, H. C. Britt, B. Budick, J. Chang, C. Chasman, Z. Chen, C. Y. Chi, Y. Y. Chu, V. Cianciolo, B. A. Cole, J. B. Costales, H. J. Crawford, J. B. Cumming, R. Debbe, J. C. Dunlop, W. Eldredge, J. Engelage, S. Y. Fung, E. Garcia, M. Gonin, S. Gushue, H. Hamagaki, L. F. Hansen, R. S. Hayano, S. Hayashi, G. Heintzelman, S. Homma, E. Judd, H. Kaneko, J. Kang, S. Kaufman, W. L. Kehoe, E. J. Kim, A. Kumagai, K. Kurita, R. J. Ledoux, J. H. Lee, M. J. LeVine, J. Luke, Y. Miake, A. Mignerey, D. P. Morrison, R. J. Morse, B. Moskowitz, M. Moulson, C. Müntz, S. Nagamiya, M. N. Namboodiri, T. K. Nayak, C. A. Ogilvie, J. Olness, C. G. Parsons, L. P. Remsberg, D. Roehrich, P. Rothschild, H. Sako, H. Sakurai, T. C. Sangster, R. Seto, J. Shea, K. Shigaki, R. A. Soltz, P. Stankus, S. G. Steadman, G. S. F. Stephans, T. W. Sung, Y. Tanaka, M. J. Tannenbaum, J. H. Thomas, S. R. Tonse, S. Ueno-Hayashi, J. H. van Dijk, F. Videbæk, O. Vossnack, V. Vutsadakis, F. Wang, Y. Wang, H. E. Wegner, D. Woodruff, Y. Wu, H. Xiang, G. H. Xu, K. Yagi, X. Yang, H. Yao, D. Zachary, W. A. Zajc, and F. Zhu (E-802 Collaboration)

**Hadronic Physics and QCD**

Thermal $\rho$ and $\sigma$ mesons from chiral symmetry and unitarity *(5 pages)* . . . . . 055201
A. Dobado, A. Gómez Nicola, F. J. Llanes-Estrada, and J. R. Peláez

Unified meson-baryon potential *(7 pages)* . . . . . 055202
Fabian Brau, Claude Semay, and Bernard Silvestre-Brac

Chiral dynamics of the $p$ wave in $K^-p$ and coupled states *(8 pages)* . . . . . 055203
D. Jido, E. Oset, and A. Ramos

Strange nucleon form factors in the perturbative chiral quark model *(8 pages)* . . . . . 055204
V. E. Lyubovitskij, P. Wang, Th. Gutsche, and Amand Faessler

In-medium production of $2\pi^0$, $\eta$, and $\pi^0$ by $\pi^-$ at 750 MeV/*c* *(8 pages)* . . . . . 055205
A. Starostin, H. M. Staudenmaier, V. Bekrenev, W. J. Briscoe, A. Koulbardis, N. Kozlenko, S. Kruglov, I. Lopatin, A. Marušić, S. McDonald, B. M. K. Nefkens, N. Phaisangittisakul, S. Prakhov, J. W. Price, A. Shafi, I. Slaus, and I. Supek

*(Continued)*

PHYSICAL REVIEW C THIRD SERIES, VOLUME 66, NUMBER 5 NOVEMBER 2002

From soft to hard regime in elastic pion-pion scattering above resonances *(9 pages)* . . . . . 055206
A. Szczurek, N. N. Nikolaev, and J. Speth
Self-consistent quantum effects in the quark meson coupling model *(7 pages)* . . . . . 055207
P. K. Panda and F. L. Braghin
$\eta$, $\eta'$ photoproduction and electroproduction off nucleons *(15 pages)* . . . . . 055208
B. Borasoy, E. Marco, and S. Wetzel
Hypernuclear weak decay puzzle *(16 pages)* . . . . . 055209
C. Barbero, D. Horvat, F. Krmpotić, T. T. S. Kuo, Z. Narančić, and D. Tadić
Neutron charge radius deduced from Bragg reflection technique *(5 pages)* . . . . . 055210
J.-M. Sparenberg and H. Leeb
Vector meson production and nucleon resonance analysis in a coupled-channel approach for energies $m_N<\sqrt{s}<2$ GeV. I. Pion-induced results and hadronic parameters *(43 pages)* . . . . . 055211
G. Penner and U. Mosel
Vector meson production and nucleon resonance analysis in a coupled-channel approach for energies $m_N<\sqrt{s}<2$ GeV. II. Photon-induced results *(32 pages)* . . . . . 055212
G. Penner and U. Mosel
Analysis of pion photoproduction data *(17 pages)* . . . . . 055213
R. A. Arndt, W. J. Briscoe, I. I. Strakovsky, and R. L. Workman
Short-range repulsion and isospin dependence in the kaon-nucleon ($KN$) system *(11 pages)* . . . . . 055214
D. Hadjimichef, J. Haidenbauer, and G. Krein

**Electroweak Interaction, Symmetries**

Cross sections for neutral-current neutrino scattering on $^{208}$Pb *(6 pages)* . . . . . 055501
N. Jachowicz, K. Heyde, and J. Ryckebusch
Axial-vector current in nuclear many-body physics *(18 pages)* . . . . . 055502
Sergei M. Ananyan, Brian D. Serot, and John Dirk Walecka

**Nuclear Astrophysics**

Radiation correction to astrophysical fusion reactions and the electron screening problem *(5 pages)* . . . . . 055801
K. Hagino and A. B. Balantekin
Breakout from the hot CNO cycle via the $^{18}$Ne$(\alpha,p)^{21}$Na reaction. II. Extended energy range $E_{\mathrm{c.m.}}\sim 1.7-2.9$ MeV *(10 pages)* . . . . . 055802
D. Groombridge, A. C. Shotter, W. Bradfield-Smith, S. Cherubini, T. Davinson, A. Di Pietro, J. Görres, J. S. Graulich, A. M. Laird, P. Leleux, A. Musumarra, A. Ninane, A. N. Ostrowski, J. Rahighi, H. Schatz, M. Wiescher, and P. J. Woods
Constraining URCA cooling of neutron stars from the neutron radius of $^{208}$Pb *(8 pages)* . . . . . 055803
C. J. Horowitz and J. Piekarewicz
$^{14}$N$(^3$He$,d)^{15}$O as a probe of direct capture in the $^{14}$N$(p,\gamma)^{15}$O reaction *(7 pages)* . . . . . 055804
P. F. Bertone, A. E. Champagne, M. Boswell, C. Iliadis, S. E. Hale, V. Y. Hansper, and D. C. Powell
Constraints on the $^{22}$Ne$(\alpha,n)^{25}$Mg $s$-process neutron source from analysis of $^{\mathrm{nat}}$Mg$+n$ total and $^{25}$Mg$(n,\gamma)$ cross sections *(9 pages)* . . . . . 055805
P. E. Koehler

## BRIEF REPORTS

Three-body approach to the $K^-d$ scattering length in particle basis *(4 pages)* . . . . . 057001
A. Bahaoui, C. Fayard, T. Mizutani, and B. Saghai
Low-energy photodisintegration of $^9$Be with the molecular orbit model *(4 pages)* . . . . . 057301
N. Itagaki and K. Hagino

*(Continued)*

**PHYSICAL REVIEW C** **THIRD SERIES, VOLUME 66, NUMBER 5** **NOVEMBER 2002**

Shell model calculations of $^{108}$Sb in the *sdgh* shell *(3 pages)* . . . . . 057302
E. Dikmen, A. Novoselsky, and M. Vallieres
Interpreting recent measurements of $0^+$ states in $^{158}$Gd *(3 pages)* . . . . . 057303
N. V. Zamfir, Jing-ye Zhang, and R. F. Casten
$K_y^{y'}(0°)$ for $^3$He$(d,p)^4$He near the $J^\pi=\frac{3}{2}^+$ resonance *(4 pages)* . . . . . 057601
K. A. Fletcher, C. R. Brune, B. M. Fisher, R. P. Fitzgerald, H. J. Karwowski, D. S. Leonard, E. J. Ludwig, R. C. Runkle, M. H. Wood, W. H. Geist, K. D. Veal, and G. M. Hale
Mass formula for baryon resonances *(4 pages)* . . . . . 058201
Eberhard Klempt

## ERRATA

Publisher's Note: Shell model calculations of $^{108}$Sb in the $sdgh$ shell [Phys. Rev. C **66**, 057302 (2002)] *(1 page)* . . . . . 059901(E)
E. Dikmen, A. Novoselsky, and M. Vallieres

**Selected Abstracts from Other Physical Review Journals** . . . . . i
**Cumulative Author Index** . . . . . vi