PHYSICAL REVIEW C
INFORMATION FOR CONTRIBUTORS
(Revised January 1999)

Manuscripts which report the results of research in nuclear physics and related fields may be submitted to *Physical Review C*. The manuscripts must contain new results and not be in editorial process at another journal. (For details, see ''Editorial Policies and Practices of *Physical Review C*'' in this issue.)

Articles published in *Physical Review C* are grouped under **headings** in the table of contents. The headings now used are as follows:

Nucleon-Nucleon Interaction, Few-Body Systems
Nuclear Structure
Nuclear Reactions
Relativistic/Ultrarelativistic Nuclear Collisions
Subnucleon Aspects of Nuclei/Physics of Hadrons
Electroweak Interaction, Symmetries
Nuclear Astrophysics

Authors should suggest the headings which are most appropriate.

Information relevant to manuscript preparation and to the editorial process for this journal and other APS journals is available on the APS research-journals **World Wide Web** server at the URL http://publish.aps.org/. Information is also available via **ftp** to aps.org in the subdirectories /jrnls, /pacs, /revtex, etc., of the /pub directory. Most filenames include as an extension a suffix (beginning with a period), which indicates the nature of the file: .asc (plain ASCII), .pdf (portable document file, usable with Acrobat), .ps (PostScript), or .tex (TeX). Most files exist in two or three versions, distinguished by the suffix. Some specific files are cited where pertinent below.

Manuscripts may be submitted by a variety of **electronic modes** (including via e-print servers, direct Web upload, and electronic mail), or by conventional mail, but not by fax. Interactive **submission forms**, available on our Web server, are an integral part of the submission process for the e-print and Web modes, and are strongly recommended for electronic-mail and conventional-mail submission. These forms aid authors in supplying all the information needed in a structured format which furthers efficient processing; they also provide a location for additional information. [For authors with Web browsers without support for forms, noninteractive versions of the submission forms are available via ftp to aps.org in the /pub/jrnls directory as the sub_prc files (include filename suffix .asc, .tex, or .ps), or by request to the Editorial Office.]

If you do not use the submission forms noted above, your submission letter should specify the **author** to whom correspondence should be addressed, and give all available communications information for this individual (postal and electronic-mail addresses, phone and fax numbers). Please specify journal and section to which the paper is submitted, and give Physics and Astronomy Classification Scheme (PACS) index categories which are available via the APS Web server and also via ftp to aps.org. These categories are used in preparing the annual subject index.

Electronic submissions may be formatted in REVTeX (preferred), LaTeX, Harvmac, or plain TeX. The file must be in ASCII containing no control codes, with line lengths of 80 characters or less. All textual material of the paper (including tables, captions, etc.) should be in electronic form, as a single file. The file should produce double-spaced output. Properly prepared electronic submissions are **exempt from publication charges**, whether or not they are formatted in REVTeX and therefore also qualify for the compuscript-conversion production program described below.

For information about submission via **e-print servers** or **direct Web upload**, see our Web server at the URL http://publish.aps.org/ESUB/.

Electronic-mail submissions (and inquiries about them) should be sent to the Internet address prctex@aps.org. For the initial submission use as the subject ''submit'' followed by ''prc'' and the last name of the first author; for example, ''submit prc jones''. Include the filled-out submission form (or the equivalent information, including journal, section, postal address, etc.) in the first part of the electronic-mail message. Receipt of an electronic-mail submission will be acknowledged within 24 hours. Copies of the manuscript should *not* be sent by regular mail (only original figures) unless the electronic transmission has not been successful.

Figures for an electronic submission must be received in at least review-quality form before editorial processing can begin. Web upload or electronic-mail transmission (one figure per file) of PostScript-formatted figures will meet this need (if the files can be successfully printed in the Editorial Office). For color or continuous-tone PostScript figures, hard-copy originals are also required. The originals are needed to

ensure that the reproductions created from the electronic figure files are satisfactory. For electronic transmissions use as the subject ''submit'' followed by ''prc'', the last name of the first author, and the figure number; for example ''submit prc jones fig1''. Alternatively, authors can send journal-quality (scanner-reproducible) ''originals'' immediately by overnight mail to the Editorial Office. A third possibility is to transmit review-quality figures by fax (516-591-4141), while the ''originals'' are sent by conventional or overnight mail as soon as possible. Please mark the fax transmission as being part of an electronic-mail submission.

Manuscripts sent by **conventional mail** should be submitted in triplicate to the Editor, Physical Review C, 1 Research Road, Box 9000, Ridge, New York 11961-9000. Manuscripts should be double spaced (about 6 mm of space between lines) with ample margins, on white letter-sized paper. Poor copies and unclear or excessive handwritten inserts are not acceptable.

Hard-copy submissions of manuscripts and figures are *not routinely returned* to authors. Authors should indicate (preferably on initial submittal) if they want hard copies of the manuscript and/or figures returned (e.g., when correspondence is sent during the editorial process, and/or after a final decision has been made).

Compuscripts are author-supplied computer files that can be used for production essentially as supplied. (Some minor style modifications may be made if needed.) If the paper is accepted for publication, the file is converted to production format and coding (eventually SGML), from which base the journal pages are composed. Appropriate REVTeX files are eligible (the other electronic-submission formats are only useful for the editorial review process). Questions about file eligibility should be directed to prctex@aps.org. Papers intended for the compuscript production program should be submitted and resubmitted *only electronically*. PostScript figures may be used directly (electronically) in the production composition process.

REVTeX is APS's LaTeX macro package used to produce the standard compuscript files for our journals. The REVTeX software (macros, examples, and documentation) is available via ftp to aps.org in the /pub/revtex directory. For further information on REVTeX, inquire by electronic mail to mis@aps.org.

An information and instruction booklet regarding electronic submissions and compuscripts is available via ftp to aps.org in the /pub/jrnls/directory as the compu_inform_pr files (include filename suffix .asc, .ps, or .tex).

A signed APS **copyright-transfer** form should be included with the submission, and will be required before publication. While the transfer of copyright takes effect only upon acceptance of the paper for publication in an APS journal, supplying the form initially can prevent unnecessary delays. The form appears at the end of the 17 August 1998 issue of *Physical Review Letters* and is available from the Editorial Office, on the World Wide Web via the URL http://publish.aps.org/ or via ftp to aps.org in the /pub/jrnls directory as the copy_trnsfr files (include filename suffix .asc, .ps, or .tex). Be sure to use the latest (1/96 or later) version of the form.

The Division of Nuclear Physics of the APS requests that authors provide a **Keyword Abstract**. A request will be mailed to the authors of experimental papers; the Keyword Abstract should be forwarded to the National Nuclear Data Center.

Manuscripts should be written in scientific English, in a style consistent with that of the journal. It is not possible for the editorial office to undertake extensive corrections of manuscripts, due to time constraints and the risk that the authors' meaning might be distorted. Manuscripts requiring extensive corrections are therefore returned to the authors. For this reason, authors whose native language is not English are urged to seek help from a native English speaker. For **format and style**, consult recent issues of this journal, the *Physical Review Style and Notation Guide*, and the Fourth Edition of the *AIP Style Manual*. The *Physical Review Style and Notation Guide* is available via the APS Web server at the URL http://publish.aps.org/STYLE/. Copies can also be obtained via ftp to aps.org in the /pub/jrnls directory as the style_guide files (include filename suffix .pdf, .ps, or .tex). The *AIP Style Manual* may be obtained for $10.00 prepaid from Springer-Verlag, P.O. Box 2485, Secaucus, NJ 07096-2485.

When a manuscript is **resubmitted**, please include a summary of changes made and a brief response to all recommendations and criticisms. The interactive resubmission forms available on our Web server may be used for electronic-mail, Web-upload, and hard-copy transmission of modified manuscripts. These forms should also be used when a manuscript previously submitted to one APS journal is resubmitted to another. If the resubmission is by electronic mail, please send the complete file for the text if there have been any changes. (The filled-out resubmission form and the response to the referee should be included as the first part of the electronic-mail message which contains the modified manuscript. Use as the subject of the message ''resub'' followed by the manuscript code number and the last name of the first author; for example, ''resub cd1234 smith''.) If the resubmission is by conventional mail, please send three copies of a complete modified manuscript and include the form or

equivalent information. For any resubmission, please state whether or not the figures have been modified, and supply new PostScript-formatted figures (one figure per file) or scanner-reproducible figures if there have been such changes. Please update any other information (e.g., address and communication information) that has changed since initial submission.

The writing of the **title** deserves special care. It should convey the greatest amount of information in the smallest number of words. Words that do not carry information, such as ''The...'', ''A...'', ''On...'', ''Investigation of...'', ''Study of...'', should be omitted. For manuscripts submitted to the Comments section, ''Comment on...'' followed by the title of the paper to which the Comment refers is, however, good practice. Do not use in the title words that praise the quality of the work (precise, important, accurate), the name of the accelerator or type of detector used, names of people or places, coined words or acronyms, ''More about...'', ''...revisited'', or dangling participles (...using...). Do not use serial numbers in titles unless the number is followed by a specific title, such as ''Inelastic scattering of protons. IV. Coupled channels analyses.'' If you wish to use a serial number, please provide information on the other published articles in the series.

The names of **authors** may be listed in any order in the byline at the beginning of a paper. The author who submits the paper is responsible for ensuring that all coauthors have approved the paper and for checking that the form of each name (e.g., initials versus full names) is that normally used by the author.

Affiliations of authors should be given without abbreviation. (Use Massachusetts Institute of Technology, not MIT.) Give the city, state, and zip code for U.S. addresses; add the country for other addresses. Affiliations must be institutions, not conferences, collaborations, or temporary meeting places.

If the authors are at different institutions, they may be grouped by institution with the name of the institution following each group. If the authors are not grouped by institution, the names of institutions may be repeated following the appropriate authors or groups of authors. If this becomes cumbersome, the names of institutions may be listed following the list of authors. Each author's name should then be followed by a superscript number (or numbers) which refers to a similar superscript number preceding the appropriate institution (or institutions). Normally, the most concise presentation is preferred.

Footnotes to an author's name or address should be limited to those useful for location of, or communication with, an author. Footnotes giving electronic addresses (e.g., email, fax, or Web) of a corresponding author are encouraged. All information concerning research support should appear in the acknowledgments. Footnotes to an author's name which describe the author's position are not acceptable.

Every paper must have an **abstract**. It should be about 5% of the length of the article, but less than 500 words. It should state all subjects about which new information is given and the conclusions and results. For experimental papers it should specify clearly what quantities were measured, what nuclides were studied at what energies. It should not contain footnotes, coined words, or acronyms which are not explained.

Physical Review C tries to follow the recommendations on **symbols and units** of the International Union of Pure and Applied Physics (IUPAP) and of the National Institute of Standards and Technology. Metric units (preferably SI), not British units, are used, unless the British unit is part of the name of an object.

Recommended abbreviations for frequently used terms are listed below along with some common misuse.

Use	**Do Not Use**
μm	μ
nm	mμ
fm	F (F is for farad)
g	gm
A	amp
K	°K
sr	Sr, ster, str
u	amu
cm^3	cc
deg	DEG, DEG., deg.
keV	KEV, KeV
MeV	Mev, MEV
MeV/nucleon	MeV/u, MeV/amu, MeV/*A*
μ_N	n.m.
c.m. (=center of mass)	CM

Physical Review C follows the recommendations of the S.U.N. Commission of IUPAP on the symbols to be used for nuclides and their states. The nucleon number (mass number) of a nuclide is shown as a left superscript (^{14}N). A right superscript is used for indicating a state of ionization (Ca^{2+}) or an excited state ($^{110}Ag^{m}$,^{14}N*). A right subscript is used for indicating the number of atoms in a molecule ($^{14}N_2$). For bombarding particles, *n, p, d, t, h,* and α may be used, but not τ. For other bombarding particles, only the usual symbols ^{6}Li, ^{12}C, ... should be used. For target nuclides, use ^{1}H, ^{2}H, ^{3}H, ^{3}He, ^{4}He, ... Do not use D, T, ...

The preferred notation for a differential **cross section** is $\sigma(\theta)$, $\sigma(E,\theta)$, i.e., the angle or energy should be shown as an argument. The derivative notation $d^2\sigma/d\Omega\ dE$ is acceptable; $d^2\sigma$ by itself or $d\sigma/d\Omega\ dE$ is not. The notation *dM/dA* or *ds/dZ* is acceptable when it refers to a mathematical relationship, such as the semiempirical mass formula, but not for the characterization of data, since *A* and *Z* are not continuous.

Notation should be clear, compact, and consistent with standard usage. **Equations** should be neatly formatted, punctuated, and aligned to bring out their structure, and numbered on the right. (a) Diacritical marks (tildes, etc.) can be put over any symbol, including indices. (b) Three-vectors are generally set in roman boldface type. More general vectors, matrices, etc., are usually set in lightface italic type, although boldface may alternatively be used. (c) Be careful when using the solidus (/) in fractions. For example, $1/2a$ means $1/(2a)$, not $(1/2)a$. Use appropriate bracketing if needed to ensure clarity.

References cited in text material must be numbered in order of their first citation, and should appear in a separate double-spaced list at the end of the text. They should be designated by on-line Arabic numerals enclosed in square brackets. **Footnotes** (for subsidiary remarks, not for references) may be placed at the bottoms of printed pages. Such footnotes to text material should be designated by superscript numerals, numbered consecutively throughout the paper, and placed at the bottoms of the manuscript pages on which they are cited. Authors who do not wish to use this option should combine references and footnotes in a single list, designated by on-line numerals in square brackets, numbered consecutively in order of first citation, and placed at the end of the text. References and footnotes within tables should be designated by superscript lower-case roman letters and given at the end of the table.

In preparing the **list of references** for papers submitted to *Physical Review C* the author should be guided by the *Physical Review Style and Notation Guide*, especially Table I and the list of Journal Title Abbreviations, and by the corresponding material in the *AIP Style Manual*. The following describes the practices of *Physical Review C*:

et al. The use of *et al.* (no comma before *et*) is encouraged in the body of the paper, but discouraged in the references. The names of all authors should be given in the references, unless the number of authors is greater than **ten**.

(in press) means that the paper has been accepted for publication in a journal (or a conference proceedings). The name of the journal must be specified. If the paper has been published when the author receives the proofs, the reference should be updated in proof.

(submitted or to be submitted) means that the paper has been submitted or will shortly be submitted for publication. The name of the journal, book, or conference proceedings must be specified.

(unpublished) means that the information is unavailable in printed form. Ph.D. theses need not be marked (unpublished), since copies can be purchased.

Conference Proceedings. Name, place, and year of the conference should be specified. Specify the editors and publisher if possible. Give page number.

Preprints and Reports (electronic or hard copy). Give name of laboratory, preprint or report number, and year. Give the title if possible and especially if a preprint or report number is not available.

Books. Give publisher, year, page number.

Journal references. Phys. Rev. C **20**, 195 (1979). Nucl. Phys. **A249,** 253 (1978). (Note difference.) For Annals of Physics use Ann. Phys. (N.Y.).

(private communication) means that the information is not available either in published or report form and acknowledges the receipt of information from another source. References to private communications in which the name of one of the authors appears are not acceptable.

It is important to confirm the accuracy of bibliographic information in references. This has become more important now that the journal is online; establishing functional **hyperlinks** from reference lists to bibliographic and document databases depends on the accuracy of the data contained in the anchor reference. Since at the present time such links work only from the reference section, work cited anywhere in the paper, including in figure and table captions and in ''Note(s) added,'' should be included in the reference section.

Acknowledgments of support must be placed in an acknowledgments paragraph at the end of the text of a manuscript. Not all types of acknowledgments are appropriate for the *Physical Review*. We do not include acknowledgments to those who helped in the preparation of the document being published; to referees or editors (unless they were involved before the paper was first written); to those who contributed general encouragement (family, friends) or services which were not directly part of the research. References to positions, titles, and awards are inappropriate as are dates asso-

ciated with awards. Examples of suitable acknowledgments are thanks to other scientists for scientific guidance given in discussions or by the communication of results, mention of technical assistants who helped in the actual research, and citation of funding agencies which sponsored the work. Acknowledgments should be a simple statement of thanks for help and may not be a dedication or memorial. Acknowledgments to people should precede those of financial support.

Separate **tables** (numbered in the order of their appearance) should be used for all but the simplest tabular material; they should have captions that make the tables intelligible without reference to the text. Units should be given in the column headings. The decision on whether results should be published in long tables depends on the precision of the data, i.e., whether they can be read accurately enough from a figure, and on how many readers are likely to use the numbers relative to the space needed in the journal. If experimental results are likely to be used as reference values by other authors, the publication of the numbers is desirable. If additional numerical data can be obtained from a data center, from the author, or another source, either as tables or in electronic form, indicate how and in what format they can be obtained. Authors may prepare tables in camera-ready form, even if the rest of the paper is not so prepared. Such tables must be similar in appearance to tables composed at the American Institute of Physics. Authors should consider the feasibility of depositing extensive tabular material in the Physics Auxiliary Publication Service (**PAPS**) of the American Institute of Physics. The electronic counterpart, **EPAPS**, is similar, and accomodates color-figure, multimedia, data, and program files. The electronic material is available via the Web. The printable part of the material is usually available in the microfilm edition of the *Physical Review*. Information about EPAPS can be obtained via the APS research-journals World Wide Web server at the URL http://publish.aps.org/, via ftp to aps.org in the /pub/jrnls directory as the file epaps_up.asc, or from the Editorial Office on request.

Figures should be planned for the column width of the Physical Review (approximately 8.6 cm). If the detail shown requires it, $1\frac{1}{2}$ or 2 columns may be used. A note should be left on or with such figures. High-quality scanner-reproducible figures must be supplied. Legible duplicates should be attached to each of the manuscript copies. Figures should be numbered in the order in which they are referred to in the text. They should be identified on the *front* (outside the image area) by the number, the name of the first author, and the journal. An indication, e.g., ''TOP,'' of the intended orientation of a figure is helpful, especially in ambiguous cases. Be advised that the scanner reproduces all imperfections (e.g., correction fluid, tape, smudges, writing on the back of the figure). Each figure must have a caption that makes the figure intelligible without reference to the text; list captions on a separate sheet. Text should be placed in the caption, not on the figure. Groups of figures that share a (single) caption must be labeled ''Figure 1(a), 1(b),'' etc.

Figures must be prepared so that all details can be seen in reproduction. The smallest symbols must be at least 2 mm high after the figure is reduced for reproduction; plotted points should be at least 1 mm in diameter after reduction. Avoid small open symbols which tend to fill upon reduction, small dots, and small decimal points. If similar quantities are to be plotted several times, such as angular distributions at several energies, do not enclose each graph in a box but use instead shifted ordinate scales for each plot and enclose all the plots in one large rectangle. Graphs with large areas that are either blank or contain only text are not acceptable.

The figure itself should have labeled axes with units enclosed in parentheses. Use the form R (10^3 Ω), not $R\times10^3$ ohms. Use half spacing within compound units. Avoid ambiguous usage of the solidus (''/'') [e.g., use (mb/MeV sr), not (mb/MeV/sr)]. For complete instructions see the *Physical Review Style and Notation Guide* or the *AIP Style Manual*. When possible, integer numbers should be used on the axis scales of figures (e.g., 1, 2, 3, or 0, 5, 10, not 1.58, 3.16, 4.75). Decimal points must be on the line (not above it). Use 0.5 not 0·5. Use the same number of digits to the right of the decimal point for all numbers on the axis scales. A number must be both before and behind the decimal point. Use 0.2, not .2.

A schematic line drawing showing the experimental equipment or layout is often helpful, but photographs or artist's renderings of apparatus are not acceptable.

Photographic (continuous tone) material is **screened** (''halftoned'') within our production process. Avoid submitting prescreened prints of photographic material (see also the submission information above); reproduction of such figures is then seldom satisfactory. There is a risk of moiré patterns appearing in the final product. Laser-printer renditions of continuous-tone data are similarly problematic, since they are effectively prescreened. If possible, please submit such figures electronically as PostScript files (one image per file). There are greater possiblities for successful reproduction in the journal when data are processed directly rather than via scanning of hard-copy renditions. Alternatively, supply glossy or matte-finish photographs instead, if available. Otherwise, the resolution of the drawing software and the output device should be set as high as possible (preferably 600 dpi or higher); laser print the figure at its final published size.

Figures might be more effective in **color**. This option is available (see also the submission information above); price schedules can be obtained from the Editorial Office at Ridge.

The cost of publishing illustrations in color must be borne in full by the respective authors and their institutions. Authors who wish to avail themselves of this option should provide 35-mm slides or transparencies, or high-quality glossy prints, which should be close to the final size expected for publication. (Negatives are not acceptable.) Polaroid color prints should be avoided. Artwork must be flexible. If submitting slides, please note that they will be removed from their jackets for the color separator. In some cases, printing requirements will prevent color figures from being located in the most preferred position. Alternatively, auxiliary color figure files may be submitted electronically, to be made available for public retrieval from the AIP electronic PAPS server. Submission information is available via ftp://aps.org/pub/jrnls/paps.asc.

To alert readers of monochrome reproductions of the article that the archive figure is in color, begin the caption with ''(Color)''. Be advised that production of an editorially accepted paper that contains color can begin only after a properly completed color-illustration authorization form has been received from the authors.

The relation of the paper to **previously published** work should be explained clearly. This should include the work of other authors and previously published work of the present authors, including meeting abstracts and conference reports. If the present results correct, supplement, or supersede previous results, this should be stated. (Preprints and internal laboratory reports are not considered publications.) Indicate which results are new, as distinguished from results obtained previously.

In order to **reproduce** figures, tables, etc., from another journal, authors must show that they have complied with the requirements of the publisher of the other journal, possibly including written agreement of both publisher and author of the originally published work. (If the original journal is published by APS, only the written agreement of the original author is required to reproduce a few figures or tables.)

Enough information about the **apparatus** and methods should be presented to permit evaluation of the procedure. For example, for a scattering experiment, give relevant dimensions, target thickness and composition, energy resolution, and angular resolution. If an accelerator was used, it should be identified.

An example of **data** should be presented (such as an energy distribution, time-of-flight spectrum, or coincidence spectrum) to show the quality of the data. If results depend on theoretical assumptions, state what the assumptions are. If the measurement is relative to a standard, such as an energy or cross section, state what reference value was used. If results depend on a sign convention, state the convention and give references.

Specify **uncertainties**. Distinguish statistical and other errors. In the case of measurements relative to a standard, state whether the error includes the error in the standard.