

**PHYSICAL REVIEW LETTERS**  
**INFORMATION FOR CONTRIBUTORS**  
(Revised July 2008)

This journal, and more detailed information about it, can be found on the **World Wide Web** at the URL <http://prl.aps.org/>. Prospective authors are particularly advised to consult the information accessible via the Authors and Manuscript Submission subpages. Those looking for a specific known file may find it more convenient to consult the alphabetical listing available on the Author Forms subpage at <http://forms.aps.org/author.html>. Some useful forms and memos regarding manuscript preparation and submission appear at the end of some issues of the journal.

Manuscripts may be **submitted** by a variety of electronic modes (including via e-print servers, direct Web upload, and email), or by conventional mail, but not by fax. Web or e-print submission is strongly preferred. Interactive submission forms are an integral part of the submission process for the e-print and Web modes. 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 “free form” information.

Please specify the author to whom correspondence should be addressed, and give all available communications information for this individual (postal and email addresses, phone and fax numbers), since in various circumstances they may all be useful. Please specify journal and section to which the paper is submitted, and give PACS (Physics and Astronomy Classification Scheme<sup>®</sup>) index categories for the work. The scheme is available at <http://publish.aps.org/PACS/>.

A **copyright-transfer** form should be sent as part of your 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. Authors submitting via the Web may fill out and submit the form electronically as part of the submission process. Authors submitting via email or conventional mail should download the form, available via <http://authors.aps.org/>, and send a signed hard copy to the Editorial Office (we cannot accept forms sent via email). Be sure to use the current version, available via the above URL.

Papers should be written in scientific **English**, in a style consistent with that of the journal. The total length of a Letter should not exceed 4 journal pages; a Comment, 1 page. (Guidelines for estimating the length of manuscripts are available on the Author Forms subpage at <http://forms.aps.org/author.html> and at the end of some issues of the journal.) Submission is a representation that the work is not now being considered for publication elsewhere. Proper text reference must be made to portions previously published

or scheduled for publication, including conference proceedings. See “Prior Disclosure,” Phys. Rev. Lett. **52**, 2101 (1984).

Properly prepared electronic submissions that can be used directly in the APS electronic editorial process are eligible for a **publication-charge discount**. Those submissions that follow closely the APS REVTeX and Word formatting guidelines may qualify for the compuscript production program, under which author-supplied files are converted directly to production format and markup, rather than being rekeyed. For detailed information about electronic submissions, please see <http://authors.aps.org/ESUB/>.

Manuscripts sent by **conventional mail** should be submitted to the Editors, Physical Review Letters, 1 Research Road, Ridge, NY 11961-2701. The manuscript must be printed (double spaced) on one side of the paper only.

Normally, manuscripts and figures are *not returned* to authors. Authors should indicate (preferably on initial submittal) if they want the manuscript and/or figures returned when correspondence is sent during the editorial process, and/or after a final decision has been made.

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 and figures. These forms should also be used when a manuscript previously submitted to one APS journal is resubmitted to another. When **resubmitting electronically**, send the complete file for the text if there have been any changes. Please refer to the online documentation for more detailed instructions. If the resubmission is by conventional mail, send one copy of the revised manuscript (with figures). For any resubmission, please state whether or not the figures have been modified, and supply new electronic figures or scanner-reproducible figures if there have been such changes. It is only necessary to resend the “original” figures if the previous versions are no longer valid. Please update any other information (e.g., address and communication information) that has changed or will change since initial submission.

Fax transmission of a message to the editor, summary of changes made to the paper, or response to reviewer comments is sometimes usable by the editorial office. Nevertheless, because of the unreliable quality of faxed copy and our limited facilities for handling such correspondence we prefer that conventional, overnight, or electronic mail be used instead.

Material for publication (manuscripts, replacement pages, figures) that is sent by fax is generally unusable for review or production purposes. If you have minimal changes to your paper, we might be able to accommodate them by copying them to the good copy in the editorial office. If the changes are involved or numerous, this will not be possible. You can send pages for substitution but be sure to mark the changes so we can judge what is required if we are to consider transcribing them. In any case, send good copy by conventional or overnight mail as soon as possible. We may not be able to proceed until it arrives.

Authors are notified by electronic mail or fax of the editorial acceptance of their article. When a revised manuscript or electronic file is received after that, corrections are made by our production vendor to their SGML file already in existence. If the revisions are not separately and explicitly described, the author may be requested by the editorial office to provide such a description. When technical or styling questions arise during the production process, we attempt to contact the author by phone, electronic mail, or fax. Authors are given the opportunity to examine proofs, normally via the Web.

---

The following are general guidelines for preparation of a conventional manuscript or a compuscript. In addition, memos regarding production requirements appear at the end of some issues of the journal. For **general format and style** consult recent issues of this journal and the *Physical Review Style and Notation Guide* at <http://authors.aps.org/STYLE/>. Additional style guidelines can be found in the Fourth Edition of the *AIP Style Manual*, available at <http://www.aip.org/pubserve/style.html>.

A **manuscript**, comprising all material which is to be set in type, must be typewritten (except possibly for mathematical expressions and Greek letters; see below), double spaced (3 lines per inch, at least 6 mm of white space between lines) in type size such that there are  $\leq 90$  characters/6 in., on one side only of good quality, white, approximately 8.5 $\times$ 11-in. (or A4) paper, with margins of at least 1 in. along four edges. A clear, sharp, nonerasable, black-on-white reproduction on hard-surfaced paper is acceptable as the “original.” Number all pages (including the title page). Include copies of any figures at the end of the manuscript.

Mathematical expressions should be typed, or neatly written in ink. The prime requisite is that the copy shall be clear to the production keyboarder, who is neither a physicist nor a mathematician. Unusual or ambiguous symbols (see table on page 21 of the Style Manual) should be identified by marginal notes at first appearance and subsequently when confusion might arise; for nonalphabetic symbols, give the number found on pages 44 and 45 of the Style Manual. Mark superscripts with an inverted caret below, and subscripts with a caret above, if necessary. Three-vectors and dyadics are set in boldface type (mark with a black-pencil, wiggly underline).

Editorial marking by authors, except for the resolution of ambiguities as discussed above, is rarely of sufficient value to warrant the effort.

The author must carefully **proofread** the paper to eliminate grammatical errors, misspellings, and omission of symbols. The text should be directed at a **general readership**, not specialists. Avoid acronyms and jargon, even if they seem of common usage. If unavoidable, define them in the text. **Notation** should be unambiguous, concise, and consistent with standard usage. Introduce new terminology or notation only when clearly

needed. Indent all paragraphs. Use the solidus (slash) only to denote division of mathematical quantities, to denote (optionally) an interface between materials [e.g., Ag/Cu(001)], and in “and/or.” Its meaning when used between words is usually imprecise; use the proper conjunction or punctuation.

The **length** of the paper is crucial. Avoid excess white space in figures; unneeded numbering of displayed equations may add length; references which are incomplete may lead to an underestimate of the length; and note that right-adjusted text or text with very nonuniform line length is subject to greater error in its estimated length. Also note that equations in text (undisplayed) must be simple; some equations which are presented in text may need to be displayed in the journal and thus add to the length.

Ideally, figures are planned for reduction to final journal size on the basis of their content and detail. The size of lettering should be chosen with this in mind. If the lettering is drafted too small, full reduction will not be possible; the length will have been underestimated. At final reduction, the size of the smallest capital letters and numerals is to be at least 2 mm.

Ultimately it is the responsibility of the author to provide a paper of the proper length. The Editorial Office attempts to provide some guidance. A quick-count formula is applied to each new paper. The staff makes a more careful estimate of the publication length of those whose quick count exceeds a limit value, and reports the calculation to the author. In a case of excessive length, the paper must be shortened prior to review. In a case of the estimated length being close to the final limit, the author is advised to make the next version shorter. The length restriction applies to all versions of a paper. Upon acceptance of a paper for publication, length is again considered by the staff; the author may be requested to supply the shortened version before production can proceed. The composition of the paper into

journal pages is the final criterion. If the length is still excessive, publication is delayed until satisfactory cuts are obtained.

The **title** should be concise, but informative enough to instruct the nonexpert reader and to facilitate information retrieval. Do not introduce new terminology in titles. There must be an **abstract** (double spaced) of no more than 600 characters, including spaces, which should be self-contained (no footnotes) for use in abstracting journals and databases. Comments and Replies should not include an abstract.

The **names of authors** may be listed in any order in the byline between the title and abstract. If the number of authors exceeds 40, the authors will be listed in the Table of Contents as, e.g., A. Jones *et al.* The author who submits the paper should ensure that all persons listed as authors approve the inclusion of their names, and check that the form of each name is the one normally used by that author.

**Byline addresses** are set directly under the author names. They are intended to indicate the institution where the research was done. These addresses usually consist of department or division, institution, city, state or country. Street addresses, post office boxes, etc., may be included; zip and postal codes are proper.

A limited number of byline formats are allowed: Authors may be grouped together by institution(s), with the name and location of their institution(s) following each group. It is permissible to have two groups from a single institution (different departments). A more concise presentation is a single list of authors followed by the list of institutions. A variant of this form, to show specific affiliations, is to use a key to link each author to his or her institution(s) unambiguously. The key consists of a superscript numeral, and is placed, in order, at the beginning of each institution listing; each author's name then carries the appropriate key(s). It is also permitted to give a group (collaboration) name in addition to the single full list of authors' names. The group name is put in parentheses, between the end of the list of authors and the beginning of the list of institutions. If the number of authors exceeds 40 the group name will appear in the Table of Contents.

**Byline Endnotes** to an author's name or address are intended to facilitate locating or communicating with an author. In many cases, it can be helpful to identify an author as "spokesperson" or "author to whom correspondence should be addressed." Endnotes giving email addresses of one or more corresponding authors are strongly encouraged. All information concerning research support should appear in the acknowledgments. Endnotes which describe an author's position or title are not acceptable. Endnotes are labeled with superscript \*, †, ‡, etc., or a, b, c, etc. and lead the list of **footnotes**.

Punctuate **mathematical expressions** and displayed equations as part of the sentence. In general, use *single-letter* symbols for mathematical quantities in equations and expressions, possibly with subscript or superscript indices or labels and with

argument(s) in parentheses. There are a few well established multiletter exceptions, such as the trigonometric functions. Avoid complicated superscripts and subscripts. Avoid frequent repetition of a complicated mathematical expression; represent it by some convenient symbol. Use the form  $\exp(\cdot)$  in cases of long or complicated arguments. Except for the square root of a simple quantity without superscripts, use fractional exponents instead of the radical sign. Avoid the use of bars over extended expressions. Avoid the use of diacritical marks (tildes, etc.) over groups of symbols, as well as the use of double over-symbols (e.g., a caret over a tilde). Use the solidus (/) or negative exponents for fractions in running text, and in displayed equations when this does not reduce clarity. When the extent of a denominator is ambiguous, use appropriate bracketing to ensure clarity. Give the base of logarithms (e.g.,  $\ln$ ,  $\log_{10}$ ,  $\log_2$ ). "Dangling" decimal points should be preceded or followed by zeros or deleted, as appropriate.

**Displayed equations** should be punctuated and aligned to bring out their structure. Put equation numbers in parentheses at the *right-hand* margin.

Three-vectors and dyadics are commonly set in boldface type. Four-vectors are set in italic type for Latin letters, and in ordinary type for Greek letters. Vectors in more than four dimensions may be set in either boldface or lightface (italic for Latin letters) type. More general quantities, such as matrices, operators, etc., should generally not be distinguished from scalars typographically unless essential to avoid confusion; in that case, either boldface or some sort of "decoration," such as a caret, is satisfactory. Do not use the center dot to indicate multiplication of scalars.

A final **acknowledgments** paragraph may be used to recognize named individuals who contributed scientifically to the specific research of the paper, to cite the funding agencies that provided financial support for the work, and to note the affiliation of institutions in the byline with a larger system. The statement of thanks for help should be simple and may not be a dedication or memorial. References to memberships, positions, titles, and awards are inappropriate, as are dates associated with funding. It is unnecessary to give the exact form, e.g., fellowship, scholarship, program name, in which funding was granted.

**Footnotes**, both references *and remarks*, must be numbered consecutively in order of citation, and be given in a double-spaced list at the end of the main text. The journal does not use bottom-of-page footnotes. Order a reference cited in a figure or table caption as if cited when the figure or table is *first* mentioned in the text. Cite footnotes in text, captions, or other footnotes in the form "Smith, Doe, and Jones [2]," "recent experiments [1,4-6]," or "see Ref. [8]." The names of all authors of cited papers should normally be given in the references except when the number of authors is very large (say, more than 10). If the length limit is a problem, the name of the first author followed by *et al.* (no comma before *et*) may be used for cited papers with four or more authors.

References to papers published in peer-reviewed journals are considered primary references. References to e-print archives should not be used in place of primary references. The reference should cite: journal name, volume number, page, and year (in the case of translation journals, give information for original and translation); conference name (or topic), place, year, editor(s), publisher, and year of publication; book title, editor(s), publisher, and year of publication; report issuing institution in full and identification number of the report (give title if number not available). Some examples of proper form follow (also consult recent issues of the journal).

J. M. Smith, R. Brown, and C. Green, *Phys. Rev. B* **26**, 1 (1982); *Nucl. Phys. A* **195**, 1 (1982).

J. M. Smith, *Phys. Rev. D* (to be published); R. Brown, *Phys. Rev. B* **26**, 706(E) (1982).

J. M. Smith, *Molecular Dynamics* (Academic, New York, 1980), Vol. 20, p. 20.

R. Brown, in *Charge Density Waves in Solids*, edited by C. Green, Modern Problems in Condensed Matter Sciences Vol. 25 (North-Holland, Amsterdam, 1989).

C. Green, University of Wisconsin, Madison, Report No. MAD/PH/650, 1991.

J. M. Smith *et al.*, in Proceedings of the Topical Meeting on CP Violation, Calcutta, June 1990 (unpublished).

It is important to confirm the accuracy of bibliographic information in references. This has become more important now that the journal is online. Hyperlinks will be programmed to enable readers to “click” on references and jump directly to the material cited. If your reference citations are incorrect or incomplete (e.g., missing author name, or an incorrect volume number or page), the associated hyperlinks may fail, and the usefulness of your paper in the online environment may be diminished. 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.

Separate **tables**, numbered in the order in which they are referred to in text, should be used for all but the simplest tabular material. Include them after the reference and footnotes. Each table *must* have a caption (double spaced) that makes the table intelligible without reference to the text. Column headings should be simple and contain all units; symbols should be explained in the caption. Use a single horizontal rule to separate headings and entries. Use horizontally running space to distinguish broad groups among entries, and extra vertically running

space for columnar groups. Vertical rules should not be used. Denote footnotes in a table by superscript lower-case roman letters, and list at the end of the table.

**Figures** should be planned for the column width (8.6 cm or  $3\frac{3}{8}$  in.) of the journal. If the detail shown requires it, 1.5 or 2 columns may be used. A note should be left on or with such figures. *Final-journal-size* originals or prints are preferable to oversized originals. Authors are encouraged to submit all figures electronically, even if the text of the manuscript is not submitted electronically; refer to the online instructions for more details. Figures submitted on paper should be of high quality and suitable for digital scanning, which is done at 600 or 1200 dpi depending on the level of detail; original ink drawings or glossy prints are acceptable. Be advised that the scanner reproduces all imperfections (e.g., correction fluid, tape, smudges, writing on the back of the figure, etc.). All figures must be prepared so that the details can be seen after reproduction. They must have a clear background and unbroken lines with as much black-white contrast as possible. The symbol width and lettering height on the journal page should be at least 2 mm. Avoid small open symbols that tend to fill in, small dots and decimal points, and shading or cross-hatching that is not coarse enough to withstand reproduction. Curves should be smooth; curves and lines should have consistent line widths of sufficient weight [final weight of at least 0.18 mm (0.5 point)]. The resolution of the drawing software and output device should be set as high as possible (preferably 600 dpi or higher).

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. 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 “(a), (b),” etc. The figure itself should have properly labeled axes with correctly abbreviated units enclosed in parentheses. Use consistent lettering and style as in the body of the text (use correct capitalization, unslashed zeros, proper exponential notation, superscripts and subscripts, decimal points instead of commas, etc.). Use the form  $R (10^3 \Omega)$ , not  $R \times 10^3 \Omega$ . Use half spacing within compound units, not hyphens or periods. Avoid ambiguous usage of the solidus (“/”), e.g., (mb/MeV sr), not (mb/MeV/sr). 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); do not use commas instead. 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, e.g., 0.2, not .2. For complete instructions see the *Physical Review Style and Notation Guide* or the *AIP Style Manual*.

Avoid submitting prescreened prints of photographic material or laser-printed renditions of continuous-tone data; reproduction of such figures is seldom satisfactory and there is a risk of moiré patterns appearing in the final product. If high-resolution or scalable electronic figure files are not available, supply glossy or matte-finish photographs or laser prints at the highest resolution possible and in the final published size.

In preparing figures, care should be taken to present the scientific results accurately. If images used in any of the figures have been **manipulated**, except for adjustments that affect the picture as a whole (e.g., overall brightness), the modification should be described clearly in the caption or text.

Some figures might be more effective in **color**. The cost of printing illustrations in color, which may be significant, must

be borne in full by the respective authors and their institutions.

If color is desired in the print version of the journal as well as in the online version, the author must clearly indicate which figures are intended to be printed in color as part of the submission process. Information about our pricing and payment policy for color figures in the print journal may be found at <http://authors.aps.org/tips.html>.

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.)