

APEX/JJAP: Instructions for Preparation of Manuscript

These instructions are intended for users of a standard word processor. If you use \LaTeX to prepare your manuscript, please refer to the template file attached to our \LaTeX class file.

1 General Instructions

Paper size: A4 ($21 \times 29 \text{ cm}^2$) or US Letter ($8.5 \times 11 \text{ in.}$)

Font: Times New Roman or Times-Roman (larger than 12 pt)

Line spacing: Larger than 1.5 times

Page layout:

title \longrightarrow author(s) \longrightarrow affiliation(s) \longrightarrow one blank line \longrightarrow abstract \longrightarrow page break \longrightarrow main text \longrightarrow acknowledgment(s) \longrightarrow (Appendix) \longrightarrow page break \longrightarrow reference list \longrightarrow page break \longrightarrow figure caption(s) \longrightarrow page break \longrightarrow table(s) \longrightarrow page break \longrightarrow figure(s)

[Note] Figures and tables including their captions can be embedded near the place where each figure or table is cited in the text.

Pagination: Page numbers should be consecutive throughout the manuscript including pages for tables and figures.

2 Estimation of the Length of the Paper

The length of the paper can be estimated using the following approximations. In particular, be sure to estimate the length of papers submitted as Rapid Communications, Brief Notes, and to APEX, which are limited to a maximum of four, three, and four printed pages, respectively. However, one additional printed page will be allowed, should the reference list extend beyond the four or three page limit.

Rules

Text: One line equals approximately 8.3 words $\longrightarrow L_1$ (excluding from the title to abstract and figure captions)

Equations: One equation equals approximately two lines. If the equation contains fractions, sums or integrals, etc., it is estimated to be three lines. $\longrightarrow L_2$

Tables: Number of rows plus two lines $\longrightarrow L_3$

Figures: Divide the height of each figure by 4 mm to obtain the number of lines and add two more lines $\longrightarrow L_4$

☞ Maximum size of Rapid Communications and APEX papers

$$4 \text{ pages} \doteq 434 \text{ lines} \geq L_1 + L_2 + L_3 + L_4$$

☞ Maximum size of Brief Notes

$$3 \text{ pages} \doteq 326 \text{ lines} \geq L_1 + L_2 + L_3 + L_4$$

3 First Page (Title Page)

Title:

- Common abbreviations and acronyms can be used in the title (see Sect. 13).
- A capital letter should be used only at the beginning of the first word, and for proper nouns, scientific and trade names, and chemical symbols.

Authors' Names:

- The authors' first names should preferably be spelled out.
- If the authors are from different institutions, a superscript Arabic numeral, i.e., $1, 2, \dots, n$, which corresponds to the appropriate listed institution(s), should follow each author's name.
- An asterisk should follow the name(s) of corresponding author(s).
- In the case of authors making equal contributions, the following sentence can be given as a footnote: "These authors contributed equally to this work." A dagger should follow the authors' names.

Authors' Affiliations:

- Use no abbreviations except for “Company”, “Incorporated”, and “Limited”.
- Give adequate postal addresses including the ZIP or other postal code and the name of the country.
- If an author’s present or permanent address differs from the given address, it should be given as a footnote beginning with “Present address:” or “On leave from,” which is cited with a symbol (sequence: †, ‡, §, ¶, ||, **, ††, ‡‡).
- E-mail address(es) of corresponding author(s) can be given after the institution(s) beginning with “E-mail:” (up to *three* addresses delimited with a semicolon).

Abstract:

- No more than 150 words for Regular Papers and Review Papers.
- No more than 100 words for Rapid Communications, Brief Notes, and APEX papers.
- Figures, tables, and references should not be cited in the abstract.

4 Main Body of the Text**Sections:**

- Each section should be numbered consecutively with an Arabic numeral.
Section: **1. Section title**
Subsection: 1.1 Subsection title
Subsubsection: 1.1.1 Subsubsection title
- A capital letter should be used only at the beginning of the first word, and for proper nouns, scientific and trade names, and chemical symbols.
- Up to three orders of sections (i.e., up to subsubsection) are allowed.
- There are no sections in Rapid Communications, Brief Notes, and APEX papers.

Paragraphs: Indent the beginning of each paragraph except for the first paragraph of the section/subsection/subsubsection.

Periods: Only one period is required when a sentence ends with an abbreviation.

Comments and Notes: Footnotes cannot be used in the main text. List comments and notes, if any, as references (refer to Sect. 9 “Literature, Comments, and Notes”).

5 Maths

- Equation editor must be used.
- Use the Symbol Font for Greek letters and other symbols.
- Each equation should end with a period or comma.
- Label equations with parenthesized numerals such as (1), (2) or (1.1), (1.2), ..., (2.1), (2.2).
- If an equation extends over more than one line, break the equation before an operator such that the operator is placed at the start of the new line.
- Braces, parentheses, etc., should be used in the following order: $\{[(\dots)]\}$.

6 Units**6.1 Rules of units**

- Use SI units.
- Present units in Roman type.
- Do not add “s” to indicate plural of units.
- Do not confuse the symbol for the unit (s, V, Ω , etc.) and the name of the unit (second, volt, ohm, etc.).
- Arbitrary unit must be “arb. unit” (cf. “a.u.” stands for atomic unit).

6.2 Examples of units

| | SI unit | Permitted units |
|----------------------------|---------------------|-----------------|
| Length | m | Å |
| Mass | kg | t, u |
| Time | s | min, h, d |
| Angle | rad, sr | °, ', " |
| Thermodynamic temperature | K | |
| Amount of substance | mol | |
| Frequency | Hz | |
| Force | N | |
| Pressure | Pa | bar, atm, Torr |
| Energy | J | eV |
| Heat quantity | J | cal |
| Power | W | |
| Electric current | A | |
| Electric charge | C | |
| Electric potential | V | |
| Capacitance | F | |
| Electric resistance | Ω | |
| Conductance | S | |
| Magnetic field | (A/m) | |
| Magnetic flux | Wb | |
| Magnetic flux density | T | |
| Inductance | H | |
| Luminous intensity | cd | |
| Luminous flux | lm | |
| Illumination | lx | |
| Volume | (m ³) | l or L |
| Viscosity | (Pa·s) | |
| Effective cross section | (m ²) | b |
| Gravitational acceleration | (m/s ²) | Gal |
| Radioactivity | Bq | Ci |
| Exposure | (C/kg) | R |
| Absorbed dose | Gy | rad |
| Dose equivalent | Sv | |

- Use cm³ and cm² instead of cc and sc cm, respectively.
- Use μm and nm instead of μ and mμ, respectively.

6.3 Products and quotients of units

- The product of two units must be indicated as follows.
m·N or Nm
- The quotient of two units must be indicated as follows.
m·s⁻¹ or m/s
- Do not use more than one slash unless units are parenthesized.
m/s² or m·s⁻²
m·kg/(s³·A) or m·kg·s⁻³·A⁻¹
m/(V·s) or m·V⁻¹·s⁻¹
[Note] Do not write as “m/s/s,” “m·kg/s³/A,” or “m/V·s.”

7 Acknowledgments

- Use the section title (without section number) “Acknowledgment(s)”.
- Thanks for grants, equipment, samples, etc., should be expressed in this section.

8 Appendices

Headings: “Appendix” if there is only one appendix. “Appendix A”, “Appendix B” ... if there is more than one appendix. “Appendix: Title” is also acceptable. Appendix titles should be capitalized as section titles (see Sect. 4).

Equations: Number equations as (A·1), (A·2), (B·1), (B·2), ...

Figures: Label as Fig. A·1, Fig. A·2, Fig. B·1, Fig. B·2, ...

Tables: Label as Table A·I, Table A·II, Table B·I, Table B·II, ...

[Note] There are no appendices in Rapid Communications, Brief Notes, and APEX papers.

9 Literature, Comments, and Notes

9.1 Citations

- List all the literature, comments, notes, etc., cited in the main text, using consecutive numbers.
- Footnotes are not allowed in the main text.
- Place numbers with a closing parenthesis as a superscript to cite literature in the main text, e.g., ¹⁾, ^{2,3)}, ^{4-7,11)}, after any punctuation mark.
- Give only the family name(s) to cite the author(s) of literature in the main text. If there are two authors, give both authors' family names. If there are more than two authors, write only the first author's family name followed by “et al.”

The phenomenon of spiking in solid state lasers is very well known.¹⁻³⁾ It was first reported in the very early paper of Collins et al.^{2,4)} The detailed experimental setup is described in Ref. 5.

9.2 Format of literature

- Each reference number should correspond to only one reference. Different papers by the same authors should be listed separately in the reference list under different numbers (excluding errata).
- The term “ibid.” should not be used even if the same journal or book is cited with different page numbers.
- The term “et al.” should not be used in the references. List all the authors (with the exception of software references with a very large number of authors, for which et al. may be used).

A. Journals

- 1) T. Hashimoto, K. Fujito, K. Samonji, J. S. Speck, and S. Nakamura, *Jpn. J. Appl. Phys.* **44**, 869 (2005).
- 2) R. H. Bruce, *Solid State Technol.* **48** [1], 5 (2005).
- 3) G. Asano, T. Oikawa, H. Funakubo, and K. Saito, *Jpn. J. Appl. Phys.* **42**, L1083 (2003) [Erratum **42**, L1346 (2003)].

- Sequence of items: author(s) → comma (,) → journal name → volume number (in boldface) → comma (,) → initial page → year (parenthesized).
- Abbreviations of journal names are based on ISO (refer to Sect. 17).
- No “p.” is required with the initial page number.
- Provide the issue number (bracketed after the volume number) for journals that begin with page 1 in each issue.
- Erratum should be listed under the same reference number.

B. Non-English journals

- 4) H. Sakurai, K. Takada, and E. Takayama-Muromachi, *Oyo Buturi* **74**, 22 (2005) [in Japanese].
- 5) Ju. V. Tsekhmistrenko: *Sov. Phys. JETP* **9**, 1097 (1959).

- Write the original title of the journal in Roman letters.
- Write the name of the language at the end of the item, for example, [in Japanese] and [in Russian].
- Write the title and the English-translated journal if only the English-translated literature has been consulted.

C. Books

- 6) S. M. Sze, *Physics of Semiconductor Devices* (Wiley, New York, 1981) 2nd ed., p. 55.
- 7) D. Edwards, in *Handbook of Optical Constants of Solids*, ed. E. Palik (Academic Press, New York, 1985) p. 547.
- 8) N. M. Amer and W. B. Jackson, in *Semiconductors and Semimetals*, ed. A. C. Beer (Academic Press, Orlando, 1984) Vol. 21, Part B, Chap. 3.

- Sequence of items: author(s) → comma (,) → title → editor(s) if any → name of publisher, city of publication, year of publication (parenthesized) → chapter or initial page.
- Abbreviations in the title are not acceptable.
- Publisher names can be shortened, for example, “Springer” and “Wiley.”
- Only one city of publication should be given. If the book is published in the U.S.A., the state code, such as NJ, can be given after the city name.
- Providing the initial page is sufficient (if plural pages must be specified, write “pp.” instead of “p.”)
- Write “in” before the title of the book when both the authors and the editors are provided.
- The title of the series should be provided if the book is part of a series.

D. Non-English books

- 9) T. Takenouchi, *Handotai* (Semiconductors) (Shokabo, Tokyo, 1964) p. 83 [in Japanese].

- Write the original title of the book in Roman letters followed by the English-translated title in parentheses.
- Write the name of the language at the end of the item, for example, [in Japanese].
- Write the English-translated title only if the English-translated book has been consulted.

E. Preprints

- 10) Y. Nakai, S. Kitagawa, K. Ishida, Y. Kamihara, M. Hirano, and H. Hosono, arXiv:0810.3569.

- The year of publication is not necessary here.

F. Proceedings and abstracts

- 11) A. Narazaki, J. Maruyama, T. Kayumi, H. Hamachi, J. Moritani, and S. Hine, Proc. Int. Symp. Power Semiconductor Devices and ICs, 2000, p. 377.
- 12) M. Koyama, A. Kaneko, T. Ino, M. Koike, and Y. Kamata, IEDM Tech. Dig., 2002, p. 849.
- 13) K. Kita, Y. Yamamoto, K. Kyuno, and A. Toriumi, Ext. Abstr. (52nd Spring Meet., 2005); Japan Society of Applied Physics and Related Societies, 30p-ZB-7 [in Japanese].
- 14) M. S. Joo, B. J. Cho, D. Z. Chi, N. Balasubramanian, and D.-L. Kwong, Ext. Abstr. Solid State Devices and Materials, 2004, p. 202.
- 15) T. Wada, T. Negami, and M. Nishitani, Jpn. J. Appl. Phys. **32** [Suppl. 32-3], 41 (1993).

- Do not italicize conference names.
- Use abbreviations for “Proceedings,” “Symposium,” “International,” etc.
- Some proceedings, such as Proc. SPIE, are written as journal references.

G. Presentations

16) K. K. Bhuwalka, M. Born, S. Sedlmaier, J. Schulze, and I. Eisele, presented at ULIS6, 6th Int. Conf. Ultimate Integration of Silicon, 2005.

- Write “presented at” before the name of the conference.

H. Technical reports

17) B. W. Braams, Natl. Bur. Stand. Tech. Note 724 (1972).

18) K. Hoh and Y. Yasuda, IEICE Tech. Rep. ED93-89 (1993) [in Japanese].

I. Patents

19) Y. Takahashi and M. Nawa, Japan Patent 652696 (1971).

20) A. C. Smith, U.S. Patent 3390940 (1988).

J. Unpublished works

21) N. Kunitomi and M. Kaneko, private communication.

22) M. Saito, in preparation for publication.

K. Papers in review

23) A. Tonegawa and S. Hasegawa, submitted to Jpn. J. Appl. Phys.

L. Accepted papers

24) S. Nakamura and J. S. Speck, to be published in Jpn. J. Appl. Phys.

25) Z. Shiu, Z. Hao, and J. Ni, Thin Solid Films (in press) [DOI: 10.1016/j.tsf.2008.09.1xx].

M. Theses

26) K. Aoki, Dr. Thesis, Faculty of Science, University of Tokyo, Tokyo (1988).

10 Expressions for Items Cited in Text

| | Section | Equation | Reference | Table | Figure |
|--------------------------------|---------------------------|-----------------------------|-------------------------|------------------------------|--|
| At the beginning of a sentence | Section 1 | Equation (1) | Reference 1 | Table I | Figure 1 |
| Within a sentence | Sect. 1 Sects. 2 and 3 | Eq. (1) Eqs. (2) and (3) | Ref. 1 Refs. 2 and 3 | Table I Tables II and III | Fig. 1, Figs. 2(a) and 2(b) Figs. 3–6 |

11 Product Names and Numbers

Product names and numbers such as experimental instruments, materials, etc., should appear after the manufacturer's name. There should be no punctuation between the manufacturer's name and the product name. Manufacturers' names should be concise without "Co., Ltd.," "Corp.," etc., or locations except in the acknowledgment section.

"... were observed by scanning electron microscopy (SEM; Hitachi S-4800)"

"We used a Shimadzu FTIR-8400S spectrometer to ..."

"... were obtained using a diffractometer (Bruker D8 Discover)"

12 Software and Codes

No definition is required for software and codes.

"..., we used the ab initio total-energy and molecular dynamics program VASP"

"..., we present experimental results and SPICE simulations of ..."

13 Abbreviations and Acronyms

The following abbreviations and acronyms can be used without definition in the abstract and main text.

| | |
|---|---|
| ac, AC alternating current | IR infrared |
| AM amplitude modulation | i.d. inside diameter |
| af, AF audio frequency | IC integrated circuit |
| BCS Bardeen–Cooper–Schrieffer | if, IF intermediate frequency |
| bcc body-centered-cubic | LSI large scale integration |
| bp boiling point | LED light-emitting diode |
| k, k_B Boltzmann's constant | LCAO linear combination of atomic orbitals |
| CCD charge-coupled device | LA longitudinal acoustic |
| CVD chemical vapor deposition | LO longitudinal optic |
| cp, CP chemically pure | LUMO lowest unoccupied molecular orbital |
| CMOS complementary metal oxide semiconductor | mmf magnetomotive force |
| c.c. complex conjugate | mp melting point |
| cw continuous wave | MOS metal oxide semiconductor |
| DUV deep ultraviolet | MEMS micro-electro-mechanical system |
| DNA deoxyribose nucleic acid | MBE molecular beam epitaxy |
| dc, DC direct current | MO molecular orbital |
| emf electromotive force | NIR near infrared |
| ECR electron cyclotron resonance | NAND not AND |
| EPR electron paramagnetic resonance | NOR not OR |
| ESR electron spin resonance | NMR nuclear magnetic resonance |
| e.s.d. estimated standard deviation | o.d. outside diameter |
| EUV extreme ultraviolet | QCD quantum chromodynamics |
| fcc face-centered-cubic | QED quantum electrodynamics |
| FET field-effect transistor | Q.E.D. <i>quod erat demonstrandum</i> |
| FM frequency modulation | rf, RF radio frequency |
| FWHM full width at half maximum | RPA random-phase approximation |
| H.c. Hermitian conjugate | Re real part |
| hcp hexagonal-close-packed | RNA ribonucleic acid |
| hf, HF high frequency | RT room temperature |
| HOMO highest occupied molecular orbital | rms root-mean-square |
| HWHM half width at half maximum | TA transverse acoustic |
| Im imaginary part | TE transverse electric |

TEM transverse electromagnetic
TM transverse magnetic
TO transverse optic
UHF ultrahigh frequency
UV ultraviolet

VB valence band
VHF very high frequency
VLSI very large scale integration
ULSI ultralarge scale integration
WKB Wentzel–Kramers–Brillouin

Abbreviations and acronyms other than those listed above should be defined fully the first time they appear in both the abstract and main text.

14 Tables

Paper:

- Use the same size of paper as for the main text.
- Print each table separately.
- Provide after the list of figure captions.

Numbering: Number tables with Roman numerals, such as Table I, Table II, . . .

Captions:

- Type each caption above each table (listing table captions on a separate page is not required).
- Begin with a capital and end with a period, as for a sentence.
- Capitalize only the first letter of the first word of column titles.

Table I. Fermi energy and carrier concentration for each sample.

| Sample number | Substrate temperature (°C) | Fermi level η_F (eV) | Carrier concentration n (10^{20} cm $^{-3}$) |
|---------------|-------------------------------|------------------------------|---|
| 560-2 | 520 | 0.270 | 5.67 |
| ⋮ | ⋮ | ⋮ | ⋮ |

15 Figures

Figures must be complete so that no editing will be required.

15.1 General notes

Paper:

- Use the same size of paper as for the main text.
- Print each figure separately.

Numbering:

- Number each figure consecutively in Arabic numerals, such as Fig. 1, Fig. 2, . . .
- Label related figures by lower-case letters in parentheses, such as (a), (b), (c), . . .

Captions:

- List captions on a separate sheet.
- Do not separate captions even for multiple related figures such as (a), (b), . . .
- The list of figure captions should be provided after the reference list.

Color images: Figures with color will be provided only in the online version without request (NO extra charge).

15.2 Other notes

Font:

- Select a standard font such as Times New Roman, Times-Roman, Arial, or Helvetica.
- Consider the font size because most figures will be reduced in size when printed.

Units:

- Select standard units (refer to Sect. 6).
- Units should be parenthesized after the label on the axis. A slash is also acceptable.
- Expressions such as \emptyset and $1.5E16$ should be 0 and 1.5×10^{16} , respectively, if possible.

16 Electronic Figure Files

16.1 Recommended formats

EPS: Particularly for line drawings. EPS files made using conversion software are unacceptable.

WMF: Particularly for line drawings. Files of most Windows applications can be saved as WMF.

PDF: Do not downsample or compress.

TIFF: Photos only. Resolution should be higher than 300 dpi. Line drawings are unacceptable.

JPEG: Same as TIFF.

16.2 Application files

The following Microsoft application files are acceptable.

PowerPoint: Prepare one figure as one slide in one PPT file.

Word: Place one figure on one page in one DOC file.

Excel: Prepare one figure as one file. Printed and on-screen sizes sometimes differ. In such cases, the on-screen size will be chosen.

16.3 Other notes

Size: Prepare each figure in the actual size. Enlarge for submission if necessary.

Font:

- Select a standard font such as Times New Roman, Times-Roman, Arial, or Helvetica.
- Do not use two-byte codes such as Chinese and Korean fonts.
- Use the Symbol Font for Greek letters and symbols such as $^{\circ}$.

Line width: Lines should be thicker than 0.25 pt in actual size.

Other: Files scanned by the author are unacceptable.

17 Abbreviations of Journal Titles

The List of Title Word Abbreviations (LTWA) based on ISO 4 will be applied to every journal abbreviation.