

1 SPIE journal papers: sample manuscript showing style and 2 formatting specifications

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4 ^aUniversity Name, Faculty Group, Department, Street Address, City, Country

5 ^bCompany Name, Street Address, City, Country

6 **Abstract.** This document shows the required format and appearance of a manuscript prepared for SPIE journals. It is
7 prepared using LaTeX2e with the class file `spieman.cls`. Please note that the following journals require the use of
8 structured abstracts in manuscript submissions: *Biophotonics Discovery*, *Neurophotonics*, *Journal of Biomedical Op-*
9 *tics*, and *Journal of Medical Imaging*. Structured abstracts are encouraged for the *Journal of Micro/Nanolithography*,
10 *MEMS*, and *MOEMS*. Guidelines are available on the journal website. Whether structured or single-paragraph, the
11 abstract should be a summary of the paper and not an introduction. Because the abstract may be used in abstracting
12 and indexing databases, it should be self-contained (i.e., no numerical references) and substantive in nature, present-
13 ing concisely the objectives, methodology used, results obtained, and their significance. A list of up to six keywords
14 should immediately follow.

15 **Keywords:** optics, photonics, light, lasers, journal manuscripts, LaTeX template.

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17 1 Introduction

18 This document shows the format and appearance of a manuscript prepared for submission to SPIE
19 journals. Note that this template is only intended to be used as a guideline for author convenience.
20 It is designed for optimum clarity and ease of reading for editors and reviewers, but the template
21 does not reflect the final page layout of a published journal paper. Accepted papers are profession-
22 ally typeset in XML according to the layout and design of the journal.

23 1.1 Use of This Document

24 This document is prepared using LaTeX2e^{1,2} with the class file `spieman.cls`. The LaTeX
25 source file used to create this document is `article.tex`, which contains important formatting
26 information embedded in it. Authors may use it as a template to create their own manuscript. While
27 LaTeX properly handles most formatting issues, the author may occasionally need to intervene to
28 obtain a satisfactorily formatted manuscript.

29 *1.2 English*

30 Authors are strongly encouraged to follow the principles of sound technical writing, as found in
31 Refs. 3 and 4, for example. In addition, good English usage is essential. A spell-checker can
32 be helpful to discover misspelled words, but authors should also proofread their papers carefully
33 prior to submission. Manuscripts that do not meet acceptable English standards or lack clarity
34 may be rejected. For authors who want help improving language and grammar, AI tools, such as
35 Grammarly or PaperPal, offer a low-cost editing option. Alternatively, you may wish to have your
36 manuscript professionally edited prior to submission by Editage, our recommended independent
37 editorial service: <https://www.editage.com/spie/>. SPIE authors will receive a 15% discount off
38 their services. Use of Large Language Models (LLMs) and other AI tools to clean up language
39 and grammar must be disclosed in the Acknowledgments section.

40 *1.3 Page Setup and Fonts*

41 All text and figures must fit inside a text area 6.5 in. wide by 9 in. high (16.51 by 22.86 cm).
42 Manuscripts must be formatted for US letter paper, on which the margins should be 1 in. (2.54 cm)
43 on the top, 1 in. on the bottom, and 1 in. on the left and right.

44 The Times New Roman font is used throughout the manuscript, in the sizes and styles shown
45 in Table 1. If this font is not available, use a similar serif font. The manuscript should not contain
46 headers or footers. Pages should be numbered.

47 **2 Parts of Manuscript**

48 This section describes the normal structure of a manuscript and how each part should be handled.
49 The appropriate vertical spacing between various parts of this document is achieved in LaTeX

Table 1 Fonts sizes and styles.

Document entity	Brief description
Article title	16 pt., bold, left justified
Author names	12 pt., bold, left justified
Author affiliations	10 pt., left justified
Abstract	10 pt.
Keywords	10 pt.
Section heading	12 pt., bold, left justified
Subsection heading	12 pt., italic, left justified
Sub-subsection heading	11 pt., italic, left justified
Normal text	12 pt.
Figure and table captions	10 pt.

50 through the proper use of defined constructs, such as `\section{}`.

51 *2.1 Title and Author Information*

52 The article title appears left justified at the top of the first page. The title font is 16 pt., bold. The
53 rules for capitalizing the title are the same as for sentences; only the first word, proper nouns,
54 and acronyms should be capitalized. Do not begin titles with articles (for example, a, an, the)
55 or prepositions (for example, on, by, etc.). The word “novel” should not appear in the title, as
56 publication will imply novelty. Avoid the use of acronyms in the title, unless they are widely
57 understood.

58 The list of authors immediately follows the title, 18 points below. The font is 12 pt., bold
59 and the author names are left justified. The author affiliations and addresses follow the names, in
60 10-pt., normal font and left justified. For multiple affiliations, each affiliation should appear on a
61 separate line. Superscript letters (a, b, c, etc.) should be used to associate multiple authors with
62 their respective affiliations. The corresponding author should be identified with an asterisk, and

63 that person's email address should be provided below the keywords.

64 2.2 Abstract

65 The abstract should be a summary of the paper and not an introduction. Because the abstract
66 may be used in abstracting journals, it should be self-contained (i.e., no numerical references)
67 and substantive in nature, presenting concisely the objectives, methodology used, results obtained,
68 and their significance. Please note that the following journals require the use of structured ab-
69 stracts in manuscript submissions: *Biophotonics Discovery*, *Neurophotonics*, *Journal of Biomed-*
70 *ical Optics*, and *Journal of Medical Imaging*. Structured abstracts are encouraged for the *Journal*
71 *of Micro/Nanolithography*, *MEMS*, and *MOEMS*. Helpful guidelines for structured abstracts are
72 available on the website of the journal.

73 2.3 Subject terms/Keywords

74 Keywords are required. Please provide 3-6 keywords related to your paper.

75 2.4 Body of Paper

76 The body of the paper consists of numbered sections that present the main findings. These sections
77 should be organized to best present the material. Standard parts of a research paper: Introduction,
78 Materials and Methods, Results, Discussion, and Conclusion.

79 To provide transition elements in your paper, it is important to refer back (or forward) to specific
80 sections. Such references are made by indicating the section number, for example, "In Sec. 2 we
81 showed..." or "Section 2.1 contained a description..." If the word Section, Reference, Equation, or
82 Figure starts a sentence, it is spelled out. When occurring in the middle of a sentence, these words
83 are abbreviated Sec., Ref., Eq., and Fig.

84 At the first occurrence of an acronym, spell it out followed by the acronym in parentheses, for
85 example, charge-coupled diode (CCD).

86 2.5 *Footnotes*

87 Due to problems with HTML display, use of the `\footnote{ }` command should be avoided.

88 2.6 *Appendices*

89 Brief appendices may be included when necessary, such as derivations of equations, proofs of the-
90 orems, and details of algorithms. Equations and figures appearing in appendices should continue
91 sequential numbering from earlier in the paper.

92 2.7 *Disclosures*

93 Use of Large Language Models (LLMs) and other AI tools must be disclosed along with all other
94 tools used in the study. The disclosure should describe which AI tool was used and how it was used.
95 AI tools used in such methodologies as data collection and figure creation should be disclosed in
96 the Materials and Methods section or a similar section of the paper.

97 Conflicts of interest should be declared under a separate header, above Acknowledgments.
98 Conflicts of interest include relationships, affiliations, and financial interests pertinent to the re-
99 search presented in a manuscript. Potential conflicts of interest may include employment, owner-
100 ship of stock or stock options, patents, honoraria, grants, royalties, consultancies, donations, and
101 other types of funding. Even the appearance of a conflict can constitute a breach of ethical publish-
102 ing, and therefore situations and activities that may be perceived as conflicts should be reported.
103 Conflict of interest disclosures should cover the past three years. For assistance generating a dis-

104 closure statement, see the form available from the International Committee of Medical Journal
105 Editors website: <http://www.icmje.org/conflicts-of-interest/>

106 If no conflicts of interest exist, a statement confirming “The authors declare that there are no
107 financial interests, commercial affiliations, or other potential conflicts of interest that could have
108 influenced the objectivity of this research or the writing of this paper” is included in a Disclosures
109 section of the manuscript.

110 *2.8 Code, Data, and Materials Availability*

111 In support of open scientific exchange, SPIE journals require Data and Code Availability State-
112 ments in all accepted papers. This requirement went into effect on 1 May 2023. These statements
113 should describe how to access any data that would be required to replicate or interpret the findings
114 reported in the paper.

115 *2.9 Acknowledgments*

116 Acknowledgments and funding information should be added after the conclusion, and before refer-
117 ences. The acknowledgments section does not have a section number. Include grant numbers and
118 the full name of the funding body. Use of large language models and other AI tools for language
119 and grammar clean-up should also be disclosed here.

120 *2.10 References*

121 The References section lists books, articles, and reports that are cited in the paper. This section
122 does not have a section number. The references are numbered in the order in which they are cited.
123 Examples of the format to be followed are given at the end of this document.

124 The reference list at the end of this document is created using BibTeX, which looks through
125 the file `report.bib` for the entries cited in the LaTeX source file. The format of the reference
126 list is determined by the bibliography style file `spiejour.bst`, as specified in the
127 `\bibliographystyle{spiejour}` command. Alternatively, the references may be directly
128 formatted in the LaTeX source file.

129 For books¹⁻³ the listing includes the list of authors (initials plus last name), book title (in italics),
130 page or chapter numbers, publisher, city, and year of publication. Journal-article references^{5,6}
131 include the author list, title of the article (in quotes), journal name (in italics, properly abbreviated),
132 volume number (in bold), inclusive page numbers or citation identifier, and year. A reference to
133 a proceedings paper or a chapter in an edited book⁷ includes the author list, title of the article
134 (in quotes), conference name (in italics), editors (if appropriate), volume title (in italics), volume
135 number if applicable (in bold), inclusive page numbers, publisher, city, and year. References to an
136 article in the SPIE Proceedings may include the conference name, as shown in Ref. 8.

137 The references are numbered in the order of their first citation. Citations to the references are
138 made using superscripts, as demonstrated in the preceding paragraph. One may also directly refer
139 to a reference within the text, for example, “as shown in Ref. 5 ...” Two or more references should
140 be separated by a comma with no space between them. Multiple sequential references should be
141 displayed with a dash between the first and last numbers.¹⁻⁵

142 *2.10.1 Reference linking and DOIs*

143 A Digital Object Identifier (DOI) is a unique alphanumeric string assigned to a digital object, such
144 as a journal article or a book chapter, that provides a persistent link to its location on the internet.
145 The use of DOIs allows readers to easily access cited articles. Authors should include the DOI

146 at the end of each reference in brackets if a DOI is available. See examples at the end of this
147 manuscript. A free DOI lookup service is available from CrossRef at
148 <http://www.crossref.org/freeTextQuery/>. The inclusion of DOIs will facilitate reference linking
149 and is highly recommended.

150 In the present LaTeX template, the author needs to add the DOI reference by including it in a
151 “note” in the bibliography file, as shown in the file `report.bib`, for example,
152 `note = "[doi:10.1117/12.154577]"`. The DOI may be used by the reader to locate that
153 document with the link: `http://dx.doi.org/10.1117/12.154577`.

154 *2.11 Biographies*

155 A brief professional biography of approximately 75 words may be provided for each author, if
156 available. Biographies should be placed at the end of the paper, after the references. Personal
157 information such as hobbies or birthplace/birthdate should not be included. Author photographs
158 are not published.

159 **3 Section Formatting**

160 In LaTeX, a new section is created with the `\section{}` command, which automatically num-
161 bers the sections. Sections will be numbered sequentially, starting with the first section after the
162 abstract, except for the acknowledgments and references. (Note that numbering of section head-
163 ings is not required, but the numbering must be consistent if used.) All section headings should be
164 left justified.

165 Main section headings are in 12-pt. bold font, left-justified and in title case, where important
166 words are capitalized.

167 Paragraphs that immediately follow a section heading are leading paragraphs and should not
168 be indented, according to standard publishing style. The same goes for leading paragraphs of
169 subsections and sub-subsections. Subsequent paragraphs are standard paragraphs, with 0.2-in (5
170 mm) indentation. There is no additional space between paragraphs. In LaTeX, paragraphs are
171 separated by blank lines in the source file. Indentation of the first line of a paragraph may be
172 avoided by starting it with `\noindent`.

173 *3.1 Subsection Headings*

174 All important words in a subsection (level 1) header are capitalized. Subsection numbers consist of
175 the section number, followed by a period, and the subsection number within that section, without
176 a period at the end. The heading is left justified and its font is 12 pt. italic.

177 *3.1.1 Sub-subsection headings*

178 The first word of a sub-subsection is capitalized. The rest of the text is not capitalized, except for
179 proper names and acronyms (the latter should only be used if well known). The heading is left
180 justified and its font is 11 pt. italic.

181 **4 Figures and Tables**

182 *4.1 Figures*

183 Figures are numbered in the order in which they are called out in the text. They should appear in
184 the document in numerical order and as close as possible to their first reference in the text. It may
185 be necessary to move figures or tables around to enhance readability. LaTeX will attempt to place
186 figures at the top or bottom of a page in which they are first referenced.

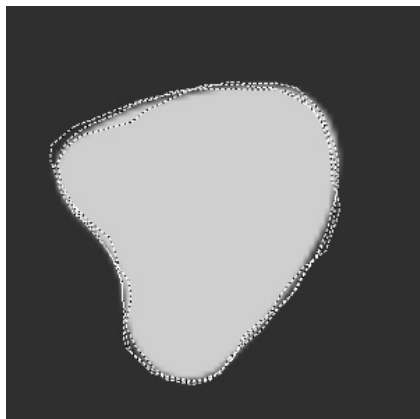


Fig 1 Example of a figure caption.

187 Figures, along with their captions, should be separated from the main text by 0.2 in. or 5 mm
188 and centered. Figure captions are centered below the figure or graph. Figure captions start with the
189 abbreviation “Fig” in front of the figure number, followed by a period, and the text in 10-pt. font.
190 See Fig. 1 for an example.

191 Authors may wish to create figures consisting of two or more images, in which case, they
192 should be neatly arranged in a rectangular array. In no case, should the article’s text be wrapped
193 around a figure. Figure 2 shows two side-by-side images. When a figure contains more than one
194 image, the author must submit them as a single image file. Further details about figure formatting
195 can be found in the author guidelines for each specific SPIE journal:

196 <https://www.spiedigitallibrary.org/journals/journal-authors>.

197 *4.2 Tables*

198 Tables are numbered in the order in which they are referenced. They should appear in the document
199 in numerical order and as close as possible to their first reference in the text. It is preferable to have
200 tables appear at the top or bottom of the page, if possible. Table captions are handled identically
201 to those for figures, except that they appear above the table. See Table 1 for an example.

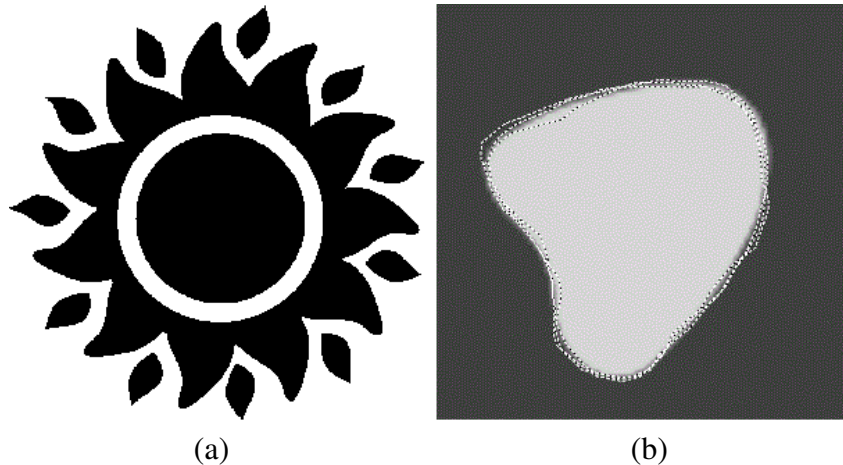


Fig 2 Example of a figure containing multiple images: (a) sun and (b) blob. Figures containing multiple images must be submitted to SPIE as a single image file.

202 4.3 Video

203 Acceptable file formats, including MOV (.mov), MPEG (.mpg), and MP4 (.mp4), are playable us-
204 ing standard media players, such as VLC or Windows Media Player. The recommended maximum
205 size for each video file is 10-12 MB. Authors may insert a representative still image from the video
206 file in the manuscript as a figure. The caption label will be linked by the publisher to the actual
207 video file. The video may also be mentioned in an existing figure caption. Multimedia files are
208 treated in the same manner as figures and they will be numbered sequentially with normal figures.
209 The video number, file type, and file size should be included in parentheses at the end of the figure
210 caption. See Figure 3 for an example.

211 **Appendix A: Miscellaneous Formatting Details**

212 At times it may be desired, for formatting reasons, to break a line without starting a new paragraph.
213 In a LaTeX source file, a linebreak is created with `\\`.

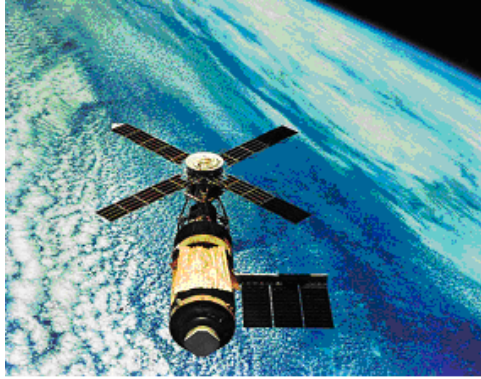


Fig 3 This satellite is a still image from Video 1 (Video 1, MPEG, 2.5 MB).

214 *A.1 Formatting Equations*

215 Equations may appear inline with the text, if they are simple, short, and not of major importance;
216 for example, $\beta = b/r$. Important equations appear on their own line. Such equations are centered.
217 For example, “The expression for the field of view is

$$2a = \frac{(b + 1)}{3c}, \quad (1)$$

218 where a is the ...” Principal equations are numbered, with the equation number placed within
219 parentheses and right justified.

220 Equations are considered to be part of a sentence and should be punctuated accordingly. In the
221 above example, a comma appears after the equation because the next line is a subordinate clause. If
222 the equation ends the sentence, a period should follow the equation. The line following an equation
223 should not be indented unless it is meant to start a new paragraph. Indentation after an equation is
224 avoided in LaTeX by not leaving a blank line between the equation and the subsequent text.

225 References to equations include the equation number in parentheses, for example, “Equa-
226 tion (1) shows ...” or “Combining Eqs. (2) and (3), we obtain...” Note that the word “Equation” is

227 spelled out if it begins a sentence, but is abbreviated as “Eq.” otherwise. Using a tilde in the LaTeX
228 source file between two characters avoids unwanted line breaks, for example between “Eq.” and
229 the following equation number..

230 *A.2 Formatting Theorems*

231 To include theorems in a formal way, the theorem identification should appear in a 10-point, bold
232 font, left justified, and followed by a period. The text of the theorem continues on the same line in
233 normal, 10-pt. font, achieved in LaTeX using `\footnotesize`. For example,

234 **Theorem 1.** For any unbiased estimator...

235 *Disclosures*

236 Conflicts of interest include relationships, affiliations, and financial interests pertinent to the re-
237 search presented in a manuscript. Potential conflicts of interest may include employment, owner-
238 ship of stock or stock options, patents, honoraria, grants, royalties, consultancies, donations, and
239 other types of funding. Even the appearance of a conflict can constitute a breach of ethical publish-
240 ing, and therefore situations and activities that may be perceived as conflicts should be reported.
241 Conflict of interest disclosures should cover the past three years.

242 If no conflicts of interest exist, a statement confirming “The authors declare that there are no
243 financial interests, commercial affiliations, or other potential conflicts of interest that could have
244 influenced the objectivity of this research or the writing of this paper” is included in a Disclosures
245 section of the manuscript.

246 *Code, Data, and Materials Availability*

247 In support of open scientific exchange, SPIE journals require Code, Data, and Materials Availabil-
248 ity Statements in all accepted papers. This requirement went into effect on 1 May 2023. These
249 statements should describe how to access any data that would be required to replicate or interpret
250 the findings reported in the paper. Authors are encouraged to make the data and code related to
251 the manuscript publicly available whenever possible, and utilize repositories that are well-known
252 to the field (FigShare, Github, CodeOcean, etc.). If the data or code cannot be made publicly
253 available, the authors should state the reason and explain how it can be obtained. Likewise, if
254 data sharing is not applicable, the statement must say so. Example statements may be found in the
255 Author Guidelines for the journal.

256 *Acknowledgments*

257 This unnumbered section is used to identify those who have aided the authors in understanding or
258 accomplishing the work presented and to acknowledge sources of funding. Use of large language
259 models and other AI tools for language and grammar clean-up should be disclosed here.

260 *References*

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278 **First Author** is an assistant professor at the University of Optical Engineering. He received his BS
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280 PhD degree in optics from the Institute of Technology in 1991. He is the author of more than 50
281 journal papers and has written three book chapters. His current research interests include optical
282 interconnects, holography, and optoelectronic systems. He is a member of SPIE.

283 Biographies of the other authors are not available.

284 **List of Figures**

- 285 1 [Example of a figure caption.](#)
- 286 2 [Example of a figure containing multiple images: \(a\) sun and \(b\) blob. Figures](#)
287 [containing multiple images must be submitted to SPIE as a single image file.](#)

288 3 This satellite is a still image from Video 1 (Video 1, MPEG, 2.5 MB).

289 **List of Tables**

290 1 Fonts sizes and styles.