Ministry of Science and Higher Education of the Russian Federation

PETER THE GREAT ST. PETERSBURG POLYTECHNIC UNIVERSITY

(SPbPU)

Institute of Electronics and Telecommunications

Higher School of Electronics and Micro-Electro-Mechanical Systems

RESEARCH REPORT

Research paper topic in lower case with first capital letter

(semester 1)

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| --- | --- | --- | --- |
| Student |  |  |  |
| group  |  | signature, date | initials and surname |

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| Supervisorposition, academic degree, academic title |  |  |
|  | signature, date | initials and surname |

St. Petersburg 2022

**SCAN COPY OF RESEARCH WORK TASK**

**ABSTRACT**

Report contains 14 pages, 1 fig., 1 table, 7 ref., 1 app.

KEYWORDS FROM 5 TO 15 WORDS OR PHRASES FROM THE TEXT OF THE REPORT IN THE NOMINATIVE CASE IN CAPITAL LETTERS, IN A LINE, SEPARATED WITH COMMA, WITHOUT WORDS WHERE, WITHOUT DOT AT THE END OF THE LIST

Object of study is

The aim is

As a result of the study, what has been done and what has been received. The results of the work, their novelty and scope. The abstract should not exceed one page.

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**DEFINITIONS, SYMBOLS AND ABBREVIATIONS**

The following definitions, symbols and abbreviations apply in this report.

CMOS – Complementary Metal Oxide Semiconductor

**INTRODUCTION**

The introduction should contain an assessment of the current state of the scientific and technical problem being solved and the initial data for the development of the topic. It should reflect the relevance and novelty of the topic, indicate the purpose and objectives of the study. The volume of the introduction is no more than three pages.

**1 The name of the first section, word wrapping in headings is not allowed, a dot is not put at the end**

The main part of the report provides data reflecting the essence, methodology and main results. The main part should contain

– substantiation of the direction of research, methods for solving problems and their comparative assessment, description of the chosen general methodology for conducting research work;

– description of theoretical and (or) experimental studies, research methods, calculation methods, substantiation of the need for experimental work, principles of operation of the objects being developed, their characteristics;

– generalization and assessment of the results of the study, including assessment of the completeness of the solution of the tasks and proposals for further areas of work, assessment of the reliability of the results obtained, justification for the need for additional research.

**The number and title of the next section, subsection, or paragraph. Headings should clearly and concisely reflect the content of sections, subsections. Each structural element of the main part of the report starts on a new page**

Illustrations (drawings, graphs, diagrams, computer printouts, photographs) should be placed in the report immediately after the text where they are mentioned for the first time, or on the next page. All illustrations in the report must be referenced. When referring, it is necessary to write the word “figure” and its number, for example: “in accordance with figure 1”, etc. The illustrations are numbered in Arabic numerals through numbering. Illustrations, if necessary, may have a title and explanatory data (figure text). The word "Figure", its number and name through a dash are placed after the explanatory data and placed in the center under the figure without a dot at the end. If the name of the picture consists of several lines, then it should be written with one line spacing. Wrapping of words in the title of graphic material is not allowed.



Figure 1 – Circuit

Digital material should be presented in the form of tables. The table should be placed immediately after the text in which it is mentioned for the first time, or on the next page. All tables in the report must be referenced. When binding, enter the word "table" and a number. The name of the table should reflect its content, be precise, concise. The heading is placed above the table on the left, without paragraph indentation in the following format: Table number - Table heading. The name of the table is given with a capital letter without a dot at the end. If the heading spans two lines or more, then it should be written with one line spacing. A table with a large number of rows can be moved to another page. When transferring part of the table to another page, the word "Table", number and name are indicated once on the left above the first part of the table, and above the other parts, the words "Continuation of the table" are also written on the left and indicate its number. When dividing a table into parts, it is allowed to replace its header or sidebar with column and row numbers, respectively. In this case, the columns and (or) rows of the first part of the table are numbered with Arabic numerals. The table is drawn up according to the model of table 1. The tables are numbered with Arabic numerals through numbering. Column and row headings must be written in capital letters. Don't put dots at the end of headings. Headings are given in the singular. Tables on the left, right, top and bottom are bounded by lines. Horizontal and vertical lines delimiting rows and columns may be omitted if their absence does not prevent the use of the table. It is allowed to use a smaller font in the table than in the text of the report.

Table 1 – Prefixes

|  |  |  |  |
| --- | --- | --- | --- |
| Prefix | Value | Prefix | Value |
| kibi | 210=1024 | kilo | 103 |
| mebi | 220=1048576 | mega | 106 |
| gibi | 230=1073741824 | giga | 109 |
| tebi | 240=1099511627776 | tera | 1012 |
| pebi | 250=1125899906842624 | peta | 1015 |
| exbi | 260=1152921504606846976 | exa | 1018 |
| zebi  | 270=1180591620717411303424 | zetta | 1021 |
| yobi | 280=1208925819614629174706176 | yotta | 1024 |

Equations and formulas are separated from the text by a separate line. There must be at least one free line above and below each formula or equation. If the equation does not fit on one line, it must be moved after the equals sign or after other mathematical symbols. The character is repeated on a new line. When translating a formula into a sign denoting the operation of multiplication, the sign "×" is used. An explanation of the meanings of symbols and numerical coefficients should be given directly below the formula in the same sequence in which they are presented in the formula. The value of each symbol and numerical coefficient must be indicated on a new line. The first line of the explanation begins with the word "where" without a colon and a paragraph indent. Formulas in the report are located in the middle of the line and are indicated by serial numbering within the entire report in Arabic numerals in square brackets at the extreme right of the line. For example, in his work, Ohm wrote the law in the following form

$X=\frac{a}{b+l}$, (1)

where $X$ is the reading from the galvanometer,

$a$ is an electromotive force depended on the thermocouple junction temperature,

$b$ is a constant of the entire setup,

$l$ is the length of the test conductor.

References in the report to the ordinal numbers of formulas are given in brackets, for example: “in accordance with formula (1)”, “in accordance with expression (1)”, etc. Numbering of formulas within the report section is allowed. In this case, the formula number consists of the section number and the ordinal number of the formula, separated by a dot, i.e. (2.1).

The report should include references to the sources used. When numbering references to documents, the numbering is continuous for the entire report. The link number is indicated in Arabic numerals in square brackets at the end of the link text. In this case, the serial number of the bibliographic description of the source in the list of references corresponds to the reference number. You should refer to the document as a whole or to its sections and appendices, for example: "in [1]–[4] ", "in [9], section 5", etc.

Detailed requirements for the preparation of the report are presented in GOST 7.32–2017 "System of standards on information, librarianship and publishing. The research report. Structure and rules of presentation".

**CONCLUSION**

The conclusion must contain

– brief conclusions on the results of the study;

– assessment of the completeness of the solution of the tasks;

– development of recommendations and baseline data on the specific use of the results;

– the results of the assessment of the scientific and technical level of the performed research on the best achievements in this field.

The volume of the conclusion is no more than two pages.

**REFERENCES**

Information about the sources is arranged in the order in which the sources are mentioned in the text of the report and are numbered with Arabic numerals separated by a dot and printed with a paragraph indent.

Examples of periodicals

1. G. Wang, M. Atef and Y. Lian, "Towards a Continuous Non-Invasive Cuffless Blood Pressure Monitoring System Using PPG: Systems and Circuits Review," in IEEE Circuits and Systems Magazine*,* vol. 18, no. 3, pp. 6-26, thirdquarter 2018, doi: 10.1109/MCAS.2018.2849261.

2. S. Song, Q. Lin, C. van Hoof and N. van Helleputte, "A 50μW Fully Differential Interface Amplifier With a Current Steering Class AB Output Stage for PPG and NIRS Recordings," in IEEE Transactions on Circuits and Systems II: Express Briefs*,* vol. 67, no. 9, pp. 1564-1568, Sept. 2020, doi: 10.1109/TCSII.2020.3002952.

An example of a book or monograph

3. R. J. Baker. CMOS: Circuit Design, Layout, and Simulation. Fourth edition – Hoboken, New Jersey: John Wiley & Sons, Inc. 2019. – 1235 p.

Examples of conference materials

4. M. Shuaib, "110dB Ω, 336MHz Bandwidth, Low Noise Transimpedance Amplifier," 2021 4th International Conference on Circuits, Systems and Simulation (ICCSS)*,* 2021, pp. 143-147, doi: 10.1109/ICCSS51193.2021.9464209.

5. A. De Villa, "A 3.86 uW Miller-Compensated Inverter Transimpedance Amplifier for Photoplethysmography Sensing," 2021 International Symposium on Electrical and Electronics Engineering (ISEE)*,* 2021, pp. 15-19, doi: 10.1109/ISEE51682.2021.9418794.

An example of a patent documentation

6. BY (country code) 18875 (patent document number) С1 (document type code). 2010 (publication date).

An example of an electronic resource

7. Web of Science. – URL: http://apps.webofknowtedge.com/ (application date 15.11.2016).

**APPENDIX A**

**Appendix name**

Appendixes may include graphs, tables, calculations, descriptions of algorithms and programs. All appendixes must be listed in the text of the report. Appendixes are arranged in the order they are mentioned in the text of the report. Each appendix must be placed from a new page. The appendix must have a title that is written in capital letters, in bold, on a separate line, centered, without a dot at the end. Appendixes are indicated in capital letters starting with the letter A. The text of each appendix, if necessary, can be divided into sections, subsections, paragraphs, subparagraphs, which are numbered within each appendix. The number is preceded by the letter of the designation of this appendix. Appendixes should have continuous pagination with the rest of the report.