**Guidelines for implementation**

**Final qualification work of the Master**

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# GENERAL PROVISIONS

Methodical instructions are developed on the basis of the Federal Law of December 29, 2012 No. 273-FZ "On Education in the Russian Federation"; the Procedure for Conducting State Final Certification for Educational Programs of Higher Education - Bachelor's Programs, Specialist Programs and Master's Programs (SMKO MIREA 7.5.1/03.H.30-19); Temporary procedure for conducting state final certification for educational programs of higher education - bachelor's programs, specialist programs and master's programs (SMKO MIREA 8.5.1/03.P.40-20); Regulations on the final qualification work of students enrolled in educational programs for the preparation of masters (SMKO MIREA 7.5.1/03.P.68-18); The procedure for checking the amount of borrowing and posting on the Internet final qualification works and scientific reports on the main results of the preparation of dissertations (SMKO MIREA 7.5.1/03.P.57-18); Recommendations for the design of written works of students on the educational programs of bachelor's, specialist and master's degree (SMKO MIREA 7.5.1/03.P.69-16).

The purpose of the state final certification is to establish the level of training of a mirea graduate to the requirements of the federal state educational standard of higher education (FSES HE) in this area of training, as well as to identify readiness graduate to perform professional tasks.

The defense of the final qualifying work of the master (master's thesis) is public in nature and provides for the personal (full-time) submission by the master of the report on the results of the master's thesis. Correspondence, via video link with the use of Internet technologies, the student's participation in the state final certification is possible only during the implementation of educational programs in the conditions of preventive measures and is regulated by the Temporary Procedure for Conducting State Final Certification for Educational Programs of Higher Education - Bachelor's Programs, Specialist Programs and Programs Master's degree (SMKO MIREA 8.5.1/03.P.40-20).

The master's thesis should be a complete scientific research containing a solution to the theoretical or experimental (design, educational and methodological) problem in the field of science and technology corresponding to the direction of training of the master.

Based on the results of the defense of the final qualification work, the State Examination Commission (later the SEC) decides on the assignment of a master's qualification to a graduate. The assessment of the final qualification work is made on a five-point scale.

The requirements for the master's thesis are established by the relevant educational standards, the Regulations on the final qualification work of students enrolled in educational programs for the preparation of masters (SMKO MIREA 7.5.1/03.P.68-18) and the Procedure for conducting state final certification for educational programs of higher education - bachelor's programs, specialist programs and programs Master's degree (CMCO MIREA 7.5.1/03.H.30-19). As well as other local regulations.

It is desirable that the materials of the master's thesis were presented at scientific and technical conferences, specialized scientific seminars, or published (accepted for publication) in the journal "Russian Technological Journal" and in other scientific journals, collections of abstracts, conference materials and other publications.

The originality of the master's thesis is determined by the scientific novelty of the chosen topic and the authenticity of the results obtained. The master's thesis should not be a "cutting" of information by copying from various sources, which often sin student essays and term papers.

The master's thesis of a graduate of the Institute of Physics and Technology should contain a description of the practical significance of the results obtained in the selected field (confirmation of implementation or recommendations for the practical use of the results of the work).

The master's thesis must strictly meet the criterion of consistency of its topics, goals and objectives objective and established laws, laws and rules of modern science. The master's thesis in the areas of preparation of the Institute of Physics and Technology MIREA should not contain materials of an esoteric or religious nature, and should not be based on theories recognized as pseudoscientific.

# FEATURES OF WORK ON A MASTER'S THESIS AT DIFFERENT STAGES

Preparation and defense of the master's thesis, as a rule, contains the following main stages:

1. Selection and approval of the topic of the dissertation.
2. Search and analysis of literature on the topic of the dissertation.
3. Conducting theoretical and experimental research.
4. Dissertation writing.
5. Testing of results and pre-protection.
6. Dissertation defense.

## Selection and approval of the dissertation topic

The topic of the master's thesis is chosen by the supervisor in strict accordance with the requirements of federal state educational standards in the relevant areas of training of masters and master's programs and, as a rule, from the list of approved topics for this direction for the current calendar year. meeting of the graduating department and approved by the order of the rector of the University.

The student draws up an assignment to perform the final qualifying work of the bachelor in 3 copies, receives all the necessary signatures on them and then hands over one copy to the educational department (dean's office) of the institute, one to the graduating department, and the third copy is left at home and then sewn (see paragraph 3.9 of these guidelines) immediately after the title page when binding the master's thesis. The task is drawn up on a special form (Prilo No. 3 of the Regulations on the final qualification work of students enrolled in educational programs for the preparation of masters of SMKO MIREA 7.5.1/03.P.68-18), which must be taken in the educational department (dean's office) of the institute.

When choosing a research topic, one should be guided, first of all, by the relevance and practical significance of the work, and this criterion applies to both experimental and theoretical works. The formulation of the research topic should be clear, as brief as possible, contain a direct indication of the area of the tasks to be solved, the type of materials under study, the purpose of the devices being developed, etc. The Contractor must

be guided by the fact that the thesis is a complete scientific research, so the formulation of the topic of the dissertation should not be too general. In the name of the topic, phrases such as "unique method", "original device", "development prospects", "new generation device", as well as "research", "development" should be avoided,

"design", "implementation", "modeling", "problem statement", "improvement", "modernization", "development", "improvement", etc.

You should know that a graduate of the magistracy has the right to choose a research topic from those proposed by the supervisor in accordance with the directions of scientific research of the laboratory and the direction of training. Also, the graduate has the right to independently formulate the topic, goals and objectives of the dissertation, provided that they comply with the federal statestandard on therazovalny standard in the direction of training, the master's program and the above Regulations.

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| **EXAMPLE** | **Incorrectly:***New materials of* *microelectronics.***Correct:***Electrophysical and* *optical* *properties* of *new* *ferroelectric ceramics* *based* *on* barium *titanate.* **Incorrectly:***Development of physical principles and model of the gas composition sensor containing molecules* *of toxic substances,* *which* *can* be *used* *in* devices that require analysis of the composition of the gas *during the execution of technological processes.* **Correct:***Gas sensor* *based* *on* *metal oxide* semiconductor *for* *the control* *of* *toxic gases.* |

The goals and objectives of the master's thesis should be aimed at obtaining new scientific (technical, design) results in the selected field.

When formulating the purpose of the work, the rules should be followed:

1. The goal is not a process, but a result. In most cases, the purpose of the work reflects the main result that you would like to get as a result of its implementation. In some cases, the purpose of the work may be to refute a certain theory or prove the fallacy of the technique. When formulating the goal, the words "study of the phenomenon", "study of the phenomenon" should also be avoided.

properties", etc., since these words mean the process, not the result.You can use the words "identifying a pattern", "determining the parameters", "detecting the effect", "increasing efficiency", "developing a method", etc.

1. The goal should be verifiable, that is, it should be formulated so that the reader can, having familiarized himself with the conclusion of the dissertation work, clearly establish whether the desired result has been achieved.

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| **EXAMPLE** | **Incorrectly:***The aim of the work* *is* to *study* *the ferroelectric* *properties* of *nanoscale* *films of CTS.***Correct:***The aim of the work* *is* to *determine* *the critical* *(minimum)* *thickness* of the *films of* the *CTS,* *at which* *ferroelectric properties are preserved.*  |

The formulation of research tasks can be a brief plan of work that must be performed to achieve the goal. Usually no more than 5 specific tasks are formulated, which are then sequentially disclosed in the sections of the dissertation.

## Search and analysis of literature on the topic of the dissertation

The main task of the literature review is to substantiate the relevance of the chosen topic, identify the main trends in the development of the direction of research, analyze the results achieved by other researchers, assess theviability of the results of the master's thesis and the prospects for their practical use. The literary review should cover at least 50 sources, including monographs, articles in refereed journals, reference and analytical materials, regulatory documents and GOST (if necessary), patents, of which at least a third should be sources for the last 5 years.

 References to:

* Wikipedia, social networks, specialized forums, chat rooms, etc.;
* student essays, term papers and theses;
* methodical instructions on performance of laboratory works;
* newspapers (except for cases of citation of official statistical data or normative documents that are published in the newspapers "Poisk", "Rossiyskaya Gazeta"), popular science magazines ("Popular Mechanics", "Vokrug sveta", etc.);
* school textbooks and problem books;
* any sources whose authorship or output cannot be established.

In the literature review, it is recommended to use:

* journals on the subject of research, cited by the Web of Science and Scopus databases (translated versions of leading Russian journals are also indexed by these databases; the data of the English-language version can be clarified on the journal's website);
* journals included in the list of publications recommended by the Higher Attestation Commission for the publication of the results of dissertations;
* monographs and reviews on the subject of research;
* Patents.

You can use as a search engine

* Google Scholar ([https://scholar.google.ru](https://scholar.google.ru/));
* scientific electronic library eLIBRARY ([http://elibrary.ru](http://elibrary.ru/));
* open electronic libraries and electronic versions of scientific journals (for example, Russian-language versions of the journals "Solid State Physics" and

"Journal of Technical Physics" is presented in open access on the website of [the http://journals.ioffe.ru);](http://journals.ioffe.ru/)

* open registers of patents (e.g.  [www.freepatentsonline.com).](http://www.freepatentsonline.com/)

When discussing/comparing the functional parameters of the equipment used, links to the websites of manufacturers of devices and devices, software are allowed. Often students completely copy tables of parameters or graphics (for example, the spectrum of absorption / transmission of the filter) from the manufacturer's website. However, it should be remembered that master's theses can be published in the public domain on the Internet, and the policies of individual companies require mandatory approval or even prohibit the publication of data that are the property of the company. Usually such information is indicated on the official website of the company, and before using such data, you should make sure that there is no such prohibition.

Citation of textbooks (textbooks) is allowed only to substantiate fundamental theoretical provisions.

The structure of the literature review depends on the specific purpose and objective of the study and is determined by the performer himself. However, the review should reflect:

* justification of the relevance of the research and / or development topic;
* analysis of the state of the problem;
* prospects for practical use of the object of research / development;
* identification of unresolved problems in the field of research;
* problem setting, formulation of the goal of work;
* formulation of specific tasks that need to be solved to achieve the goal.

As a rule, no more than 25% of the time intended for the implementation of a master's thesis is allocated for the preparation of a literature review.

The volume of the review should not exceed 30% of the volume of the entire dissertation.

* 1. **Conducting theoretical** **and** **experimental**

**Research**

This is the main and most responsible stage of the master's final qualifying work.

The dissertation work is carried out in close contact with the supervisor and consultants, but **for** **the** **experimental** **research, decisions made, the originality and reliability of the results submitted** for protection and the data used in the **work,** the performer - the author of the work is **responsible.** measurement results or inconsistent use of colleagues' results (the word "theft" is more appropriate here), the presentation of knowingly false data, copying and reproduction of the results of the qualification works of predecessors - all this is categorically unacceptable and unworthy of a Moscow student.

The methodology for conducting experimental and theoretical research, the work plan and methods of processing the results obtained are determined by the supervisor and consultant (if any) and are not regulated by our manual. Here we will pay attention only to those aspects that may be important in the design and defense of the dissertation.

It is assumed that when conducting research, the performer shows a high degree of independence: he adjusts and prepares scientific equipment for research, prepares experimental samples, independently conducts theoretical calculations, basic experimental studies and processes the results.

To perform a number of related studies (e.g. electron microscopy or X-ray diffraction analysis)

graduates may not have sufficient qualifications. It is obvious that such studies are carried out by specialists. Nevertheless, it is recommended, if possible, to be present during such studies, to fix the measurement parameters, the modes of operation of the installation, to obtain general knowledge about the principles of operation of measuring systems, etc. During the defense of the dissertation, the performer must answer questions regarding the main conditions of all measurements, be able to give a general description of all the techniques used.

When preparing the main part of the dissertation work, the performer is obliged to strictly observe the work schedule of the unit (laboratory) in which the work is performed, the rules and safety standards, follow the instructions of the supervisor and consultant.

To perform this stage of the work, 65 - 70% of the total time for the preparation of the dissertation work is spent.

## Dissertation writing

#### Requirements for the style of presentation

The text of the master's thesis is a brief and convincing description and proof of the completeness and reliability of the results of the work aimed at achieving the goal of the dissertation. Each of the formulated tasks should be reflected in the appropriate section, and the established requirements should be met. At the same time, the choice of the method of solving these problems should be described as concisely and reasonably as possible. , and more details

– the decision itself, the results obtained, their analysis and their scientific and (or) practical significance.

The fundamental principle of presentation of the dissertation materials is the accuracy of the scientific language, which excludes the ambiguity of perception and interpretation of the described problems, the tasks to be solved and the results obtained. The thesis should be written in a competent literary language using the vocabulary adopted in the scientific community, legalized terms, definitions and units of measurement of physical quantities.

All units of measurement are specified in the SI system.

Particular attention should be paid to fragments translated from a foreign language with the help of translators. Currently, there are no programs that provide sufficient quality when translating to

Russian language, so such fragments require additional work with the text and checking terminology.

The text of the master's thesis is drawn up in accordance with GOST 7.322001 (Interstate Standard. System of standards for information, library and publishing. Report on research work. Structure and rules of registration.) and GOST 2.105-95 (Unified system of design documentation. General requirements for text documents), Recommendations for the design of written works of students on educational Programs Undergraduate Specialty и Magistracy (SMKO MIREA 7.5.1/03.P.69-16) in Russian. Requirements for the composition of the annexes to the master's thesis, their content and form of presentation establishes scientific chief.

The various sections and subsections of the dissertation should be logically and stylistically related. The presentation of the material in the text of the dissertation should be strict, concise, clear, should be devoid of emotional coloring and subjective perception of the results presented. In scientific publications, it is customary to use impersonal turns of phrase, without stylistic decorations, metaphors, anecdotes and other means of emotional coloring of the text. It is unacceptable to use first-person singular pronouns in the text.

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| **EXAMPLE** | **Incorrectly:***I found that...* *I first obtained the values... So* *I* *conclude...***Correct:***The author has established that...* *In this paper* *for the* first time *obtained* *values* *...* *Hence* *the* *conclusion...* |

A mandatory requirement is the use of the same terms, definitions and designations of physical quantities in all sections of the dissertation. The most common errors **of** this kind are:

* simultaneous use of abbreviations in Russian and English to refer to the same concept (for example, the abbreviations AFM and AFM are used simultaneously to refer to atomic force microscopy);
* simultaneous indication of units of measurement in English and Russian language (for example, mW and mW);
* the use of different notations for the same physical quantity in different chapters of the thesis (for example, in Chapter 2, the thickness of the film is indicated by the letter *h,* and in Chapter 3 by the letter *d);*
* the use of synonymous terms, especially when directly translating the term from English (for example, ferroelectrics - ferroelectrics);
* introduction of proper "original" notations instead of generally accepted for basic physical quantities (for example, to denote mass, use the letter *F* instead of *m).*

A comment should be made with regard to the latter. Copyright allows the introduction of its own designations. However, since the dissertation work is qualifying and subject to verification, such amateur aeto can lead to an error on the part of both the author and reviewers, which, ultimately, complicates a fair assessment of the work. This is a sufficient reason to consider such errors unacceptable in a master's thesis.

#### Structure and main content of sections

The master's thesis includes the following mandatory sections (indicated in order of the thesis):

1. title page
2. abstract
3. content
4. regulatory references (if necessary)
5. definitions, designations and abbreviations (if necessary)
6. introduction
7. the main part of the dissertation
8. conclusion
9. Bibliography
10. Application. (if necessary)

The economic part is not included in the structure of the master's thesis. In the case when the work is devoted to the development of technology or the creation of a specific device, the economic aspects of the work are reflected to some extent in the main part. Also, commercial development opportunities can

be reflected in the form of an act of implementation, user feedback, a document on legal protection (patent) - all materials of this kind are submitted to the annexes.

Next, we will consider in detail the composition and features of the design of each section of the dissertation.

1. Title page

The title page contains data on the topic, author, supervisor and the department where the work was performed. The standard form and an example of the design of the title page are given in Appendix A.

1. Abstract

The abstract of the master's thesis is a brief characteristic of the work and should contain:

* information on the volume of the dissertation, the total number of pages of text, the number of figures, tables, annexes and bibliographic references;
* a list of keywords (from 5 to 15 words or phrases from the text of the dissertation, most characterizing its content and providing the possibility of information retrieval; keywords are given separated by a comma in the nominative case, printed in lowercase letters);
* purpose of work;
* method (methods) of research;
* a list of key results;
* description of the relevance and novelty of the results obtained;
* the scope of application of the results obtained, their technical and economic, scientific or educational and methodological efficiency and significance;
* indication of the number of publications on the topic of the dissertation (articles, patents, etc.). At Need в Abstract Can give Links on Grants or R&R,

within the framework of which the work was carried out, and the centers of collective use (scientific and educational centers), the equipment of which was involved in the performance of research. Here is also information about the awards, prizes, diplomas, etc., which were awarded to the work (for example, "The results of the dissertation were awarded the diploma "For the best report of young scientists" at the conference ...").

The volume of the essay, as a rule, does not exceed 2 pages. The recommended structure of the abstract is given in Appendix B.

1. Content

The content of the thesis should include all sections and numbered subsections of the work with the indication of pages. It is convenient to arrange the content using the automatic generation provided by text editors (if the text is structured with the selection of headings) or to do it manually in the format of a table (use invisible borders). It is recommended to form (fill) this section after writing the main part of the work, when its structure becomes final.

1. External links

The section "Normative references" contains a list of standards and other normative documents that are used in the dissertation and to which references are given in the text of the dissertation. The list of standards begins with the words:

"This dissertation uses references to the following standards and normative documents:".

With the fundamental nature of the master's thesis, references to standards and normative documents may not be used. In this case, this section can be omitted. If there is a design/technological part in the master's thesis, when developing methods and standards during the work, as well as in the development of methods and standards. fundamentally new elements and devices, the assessment of the compliance of the results of work with existing standards is inevitable and mandatory, so the relevant regulatory references must be given.

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| **EXAMPLE** | EXTERNAL LINKSIn this dissertation, references to the following standards and normative documents are used: GOST 2.503 – 90 ESKD. Rules for making changesGOST R VD 2.601 – 96 ESKD. Operational documents***...*** |

1. Definitions, designations and abbreviations

The first part of the section contains a list of definitions, designations and abbreviations used in the dissertation. The list of definitions begins with the words: "In this dissertation, the following terms with appropriate definitions are used:". you should enter only this section

definitions specific to the field/research method. At the same time, it is necessary to be guided by the principle of reasonable sufficiency and to give only the most important definitions for understanding the provisions of the dissertation. In the case when the author believes that all the definitions used by him are generally accepted and do not require detail, this part of the section can be deleted.

When drawing up a list of designations and abbreviations, designations, symbols, etc. are given on the left, and their decoding is given on the right:

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| **EXAMPLE** | DESIGNATIONS AND ABBREVIATIONSIn this dissertation, the following designations and abbreviations are used: CTS - lead zirconate-titanate, PbZrTiO3FEM – translucent electron microscopy.CVD is a chemical vapor deposition, a method of manufacturing thin films by chemical deposition from the vapor phase.С1-N – designation of samples of series С1, N – number of the sample.**...** |

1. Introduction

The introduction formulates the expediency of choosing the direction of research, gives a brief assessment of the current state of the problem being solved, details the basic concepts that are common to all sections of the dissertation, indicates the connection with related scientific areas, substantiates the need for staging the work and the initial data for its implementation. The volume of the introduction is 2-3 pages.

1. The main part of the dissertation

The main part of the thesis includes sections (from two to five), which present a review of the literature, a description of the research methodology, calculations, description and analysis of the results obtained.

The first section is mandatory and contains a review of the literature, which provides the results of the analysis of the state of the problem, the justification of the relevance of the work, the formulation of tasks that are necessary to achieve the goal of the dissertation work, the justification for the choice of methods and means of their implementation is given.

The content of the remaining sections of the main part is determined in such a way as to demonstrate the solution of the tasks set in the dissertation.

Each section should contain subsections in which thematically divided, for example, the introductory part, the theoretical introduction, the details of the experiment (description of the experimental installation), the results and their discussion, etc. The structure, subject and number of divisions into subsections are determined by the author of the work and are consistent with the supervisor.

The main part should contain:

* description of the fundamental foundations of model construction, theoretical substantiation of calculations and approximations (a large amount of intermediate theoretical calculations can and should be placed in the application with the appropriate reference in the text);
* description of the methodology and course of the experiment (scheme or block diagram of the experimental installation, measurement modes, the main functional parameters of the equipment (for example, the wavelength of laser radiation) necessary for calculations and / or interpretation of the results, a description of the methodology and sequence of measurements with a demonstration of the experimental data obtained, the results calculations and modeling;
* analysis and explanation of the significance of the results obtained (description of the models within which the analysis is carried out and their application, comparison with similar results obtained by other researchers, comparison of the results of theoretical and experimental studies, etc.),
* verification of the reliability of the results obtained, assessment of possible sources of errors;
* recommendations for the implementation (practical use) of the results obtained.

The description in the master's thesis of the properties of substances and materials must comply with GOST 7.5488 (System of standards for information, library and publishing. Presentation of numerical data on the properties of substances and materials in scientific and technical documents. General requirements.), the designation of units of physical quantities is given according to GOST 8.417-2002 (Interstate Standard. State system for ensuring the uniformity of measurements. Units of magnitude).

Each section should end with briefly formulated conclusions, the purpose of which is, depending on the subject of the section, summing up the results of the work on the section, assessing the degree of completion of the task, comparing the results obtained with analogues, recommendations for the further use of the results obtained. The formulation of the conclusions should ensure a logical transition to the next section.

1. Conclusion

The conclusion of the master's thesis should contain:

* a list of results and conclusions based on the results of the master's thesis;
* a reasonable assessment of the sufficiency and completeness of the solutions to the tasks set to achieve the goal of the dissertation, assessment of the compliance of the results obtained with the goal of the dissertation set in the task;
* recommendations and initial data on the scientific and / or practical use of the results of the master's thesis;
* assessment of the technical, economic, scientific or other effectiveness of the implementation of the results obtained in the master's thesis (if any);
* assessment of the scientific and technical level of the work performed in comparison with the best Russian and foreign achievements in this field (for example, "The achieved conversion efficiency exceeds known analogues by 15-20%").

When listing the results, the wording is used, the most meaningful, but briefly reflecting the achievement of the goals and objectives of the work. Generalizations should be avoided, preferring specific values of the values obtained.

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| **EXAMPLE** | **Incorrectly:**1. *Samples of* *thin* films *were obtained.*
2. *It is shown that* *the Curie* *temperature* *for* *samples* *slightly* *exceeds* the *value* for bulk *materials.*

**Correct:**1. *Samples of* *epitaxial* *thin* *films AVO* *3* with a thickness *of* *3* *nm* *with* *low* defectivity were *obtained.*
2. *The Curie* temperature *for* the *samples* *obtained* is *334* *K,* *which* *is* *5K*

*exceeds the critical* *temperature* *value* *for* *bulk* *materials.* |

If there are publications on the topic of the dissertation, you can give in this section brief information about their number, the names of the conferences where the results were presented. A list of publications (bibliography) is usually provided in the annex.

In conclusion, it is appropriate to express personal gratitude to colleagues, for example, for assistance in the manufacture of samples or conducting specific research, centers for collective use (scientific and educational).

centers), equipment Which attracted for Perform Research а Also provide links to grants or R&R, within which the work was performed.

1. Bibliography

In the text of the master's thesis, the author is obliged to provide references to **all** cited and borrowed (for example, tabular values, reference materials, GOSTs, etc.) materials, research and development results, ideas, hypotheses, judgments and other results obtained by other researchers. Sources of information can be any publications in the periodical press, textbooks, monographs, Internet publications, sites of equipment manufacturers, patents and etc. The absence of appropriate references to materials that do not belong to the author is equated with plagiarism and may be the basis for preventing the master's thesis from being defended at any stage of its consideration. When using in the text of the dissertation the results obtained by the author personally or in co-authorship, and published in the open press (or accepted for publication with confirmation from the editorial board), it is also necessary to provide appropriate references to them.

Any results obtained in co-authorship should be noted in the text of the dissertation as performed jointly and, if necessary, indicating the degree of participation of each of the co-authors. By default, it is assumed that the supervisor of the work is always directly involved in the formulation of the goals and objectives of the study, the interpretation of the results of the work and the assessment of the completeness of the solution of the tasks. Therefore, this type of co-authorship is usually not indicated.

Information about the sources used is given in accordance with the requirements of GOST 7.1-2003 (System of standards for information, library and publishing. Bibliographic record. Bibliographic description. General requirements and rules of compilation).

1. Application

The annexes include materials that are part of the master's thesis, but for various reasons can not be included in the main part. It is recommended to give as an annex a bibliographic list of publications on the results of the dissertation and patent documents obtained by the author as a result of the dissertation (according to GOST 7.1-2003).

Applications can and should also be placed:

* intermediate theoretical calculations and transformations of a large volume, the reduction of which in the main part is impractical;
* test reports (measurements);
* description of methods (instructions, laboratory regulations) developed in the course of work;
* description of the parameters of the equipment and devices used in the behavior of research, description of the modes of operation of devices and devices;
* computer programs;
* drawings, design and technological documentation;
* acts of implementation of results, copies of contracts, other source documents related to the performance of work;
* report on patent research, issued in the words of GOST 15.0115.12.3, if the thesis provides for patent research;
* additional information or data obtained in the course of the work, but beyond its goals and objectives, including information about the awards that the work or object of development was awarded (for example, an exhibition diploma), information about Internet resources prepared on the basis of the results of the work, etc.

#### Dissertation abstract

The abstract of the dissertation is not a mandatory element and is provided by the decision of the graduating department. The main task of the abstract is a brief description of the results, which makes it possible to make a general idea of the work performed. Usually, the following points are introduced into the structure of the abstract:

* goals and objectives of the work
* relevance and novelty of the proposed study
* information about the testing of the results (if any)
* information about the practical implementation of the results of the work (if any)
* summary of the chapters of the dissertation
* list of publications on the topic of the dissertation (if any).

The abstract is provided without fail, if the results of the dissertation for one reason or another can not be published in the open press. In most cases, the abstract is a copy of the abstract

Master's thesis (see above) with a more detailed presentation of the chapters and results of the dissertation.

Unlike a master's thesis, the abstract is not subject to approval and coordination with the head of the department, but is signed only by the dissertent and his supervisor.

An example of the design of the title page of the abstract is given in Appendix B.

## Testing of results and pre-defense

The results of the master's thesis must be verified and confirmed their authenticity and reliability. Evidence of successful approbation of the results of the study can be:

* publications in scientific and technical refereed journals and collections;
* certificates of legal protection of the results of the dissertation (patents for inventions, utility models, programs, etc.);
* reports at specialized conferences, exhibitions, seminars, competitions, etc.;
* discussion of the results of the dissertation at the meetings of the graduating department.

In addition to scientific and technical conferences of different levels, regularly held in Russia and abroad, for students of the Institute of Physics and Technology there are the following opportunities to present the results (presentations with a report):

* annual Russian Scientific and Technical Conference with international participation "Innovative Technologies in Electronics and Instrumentation" ("RSTC PTI"), the dates of the event are April-May;
* regular scientific seminars of the departments of the Institute, usually held at intervals of once a month.

Information about the approbation of the results of the dissertation is indicated without fail in the abstract, and can also be given in other sections (for example, in the conclusion or in the appendix "List of publications on the results of the dissertation").

####  Plagiarism check

The results of the thesis provide for a plagiarism test. This check is performed by the supervisor or an authorized employee of the graduating department. He is also responsible for the reliability of the results of this check. The result of the check is attached to the dissertation in the form of a screenshot with a table of test results in a special search system for plagiata ("Antiplagiat", "Rucontext", etc.), officially acquired Educational and methodological management of the University for the current year.

A dissertation is allowed for defense if the volume of the author's (original) text is at least 70% of the total volume of the dissertation.

#### Pre-protection

Pre-defense provides for a speech at a meeting of the department with a presentation in ms Power Point format on the results of the dissertation. Pre-defense is usually carried out 1-2 weeks before the defense and is a "dress rehearsal in costumes", that is, the staff of the department is presented with the same report that will be made by the graduate before the State Examination Commission.

During the defense (and hence the pre-defense), the student is usually given no more than 10 minutes for the report. When making a presentation, you need to be guided by the rule "One slide - one minute", that is, at least 1 minute of speech should be given to 1 slide, except, of course, the title one. Thus, with a report time of 10 minutes, the presentation should contain no more than 11 slides.

 In most cases, the presentation structure looks like this:

* title slide (thesis topic, name and number of the student's group, name of the supervisor, name of the department and laboratory where the work was performed);
* relevance and novelty of the study (maximum 2 slides);
* goals and objectives of the work (1 slide);
* the main results obtained (about 5-6 slides);
* main results and conclusions of the work (1 slide). Recommendations:
1. Be sure to rehearse and timekeep several timesreport. Number the slides. Use white (best of all) or plain light background and Arial font - it will not be distorted when copying. Do not abuse animations and special effects. Use thick (at least 1.5 pt)lines of dark, saturated tones for graphs. It is recommended to save the file with the introduction of fonts (the option "embed only the characters used in the presentation"), which will avoid the appearance of "squares" instead of symbols when demonstrated on a "foreign" computer.
2. Do not waste time describing the experimental installation, if its development and assembly is not included in the list of tasks of the dissertation.
3. Do not waste time describing standard and well-known measurement techniques, such as, for example, electron microscopy, X-ray or spectral analysis, etc. In the vast majority of cases, members of the SEC are aware of this no worse than you, and you have already used the chance to demonstrate your knowledge in this area in exams. A fair story is enough. That the research is done by such and such a method. In this case, it is useful to present the main measurement modes or parameters on the slide, but it is also not necessary to read them if this is not important for the description of the results.
4. Do not read large amounts of text from the sheet, it is very tiring for listeners and takes a lot of time. If you want to cite a large amount of text on a slide for some reason, try to put the contents in your own words, adhering to the principle of "One slide, one minute". Avoid solid text. Use numbered and bulleted lists. Use short sentences or phrases. Don't carry words.
5. Do not include tables larger than 3x3 (three rows, three columns) in your presentation. The three-dimensional tables on the slide look small and are not information sources, since the commission does not have time to look at them. If necessary, such information can be included in an additional handout or select several important items from the summary table.
6. When presenting formulas, graphs, and pictures, use large font so that all captions are visible even from the last row.
7. It is not necessary to demonstrate **all** the results obtained (in some works the number of illustrations reaches hundreds), it is enough to cite the main or most characteristic dependencies on which the justification and interpretation of the results are built.

Some very useful tips and tricks for preparing a presentation and report can be read, for example, here: <http://kib.nsu.ru/?page_id=39>.

Pre-defense usually takes place at a meeting of the department or at a scientific seminar, so you need to worry in advance about the appointment of a date and time. If possible, you should check in advance how the presentation looks on the audience screen: you may have to change the design, font or enlarge some illustrations.

At the pre-defense, you should be prepared for the fact that difficult questions will be asked and criticisms will be expressed. However, their purpose is not to "overwhelm" the student, but to identify problem areas in the work and give an opportunity to correct mistakes, as well as prepare for their discussion at Protection. Therefore, it is useful to agree with your comrades so that they are present at the pre-defense and write down the comments made to you, so that they can then discuss them with the supervisor and consultant.

Upon successful completion of the pre-defense procedure at the graduating department, the head of the department decides on the admission of the student to the defense, making an appropriate entry on the title page of the dissertation. If, according to the results of the pre-defense, the head of the department does not consider it possible to allow the graduate to defend, this issue is considered at a meeting of the department and submitted for approval to the director of the institute.

It should be remembered that pre-defense is an informal event and under no circumstances can be equated with defense or credited as a defense if the student for some reason did not appear on the day appointed for the defense of the dissertation.

## Thesis defense

Students who have successfully completed the course of study and prepared master's theses are allowed to be defended by the head of the graduating department on the proposal of the scientific supervisor of the work.

Conditions of admission of the author of the master's thesis to the defense:

* successful mastering of the master's program of study in accordance with the curriculum (the student should not have a single debt);
* compliance of the master's thesis prepared by the author with the requirements of the Moscow Technological University and timely (in accordance with the schedule of work on the dissertation) its submission to the supervisor;
* positive feedback of the supervisor about the applicant and his work on the dissertation (the dissertation itself is not evaluated by him);
* positive feedback of the reviewer (opponent) about the master's thesis prepared by the author (the identity of the applicant and his work on the dissertation is not evaluated).

In addition to the presentation, the student must prepare and have the following set of documents on the day of the defense:

* an intertwined copy of the dissertation (hardcover), in which the original task for the final qualification work (master's thesis) signed by all instances is sewn immediately after the title page;
* dissertation abstract (if necessary);
* a printed document certified by the head on the results of checking the text for borrowings;
* the original review of the supervisor;
* the original reviewer's review (if the reviewer is from a third-party organization, his signature must be certified by the seal of this organization);
* CD-ROM or other electronic media in accordance with the requirements of the SEC with recorded on it:
	+ electronic version of the thesis and abstract – in pdf and doc formats (docx, rtf)
	+ electronic version of the presentation – in pdf or ppt (pptx)
	+ scanned task for the final qualifying work (master's thesis) with signatures – pdf format
	+ scanned feedback of the supervisor – pdf format
	+ scanned reviewer review – pdf format
	+ scanned data on checking the text for borrowings – pdf format;
* electronic version of the presentation on a flashdrive;
* handouts (at least 3 copies, usually by the number of members of the SEC);

The protection procedure basically coincides with the pre-protection. The student is usually given no more than 10 minutes for a report, no more than 5 minutes for answers to questions from members of the commission. More stringent time frames require a more thorough approach to the preparation (rehearsal) of the report.

As a handout, the presentation of the report is usually printed out with the addition of additional material if necessary - a list of publications, a scheme of the experimental installation, summary tables of results, intermediate theoretical calculations and other auxiliary materials on discretion of the student and his supervisor. Usually, the additional material is no more than 2-3 sheets. It is necessary to find out in advance from the SECRETAR how many copies of the handout should be submitted.

It should be remembered that at the defense the student must demonstrate a high degree of independence in discussing the results obtained. Confident,calm answers of the student to the questions asked, demonstration of sufficiently deep knowledge in his field and, most importantly, demonstration of understanding of the physical principles, goals and objectives of his own research - all this contributes to obtaining a high grade.

The applicant needs to be ready to answer the following questions, which are always asked on defense:

1. What is your personal contribution to the presented work?
2. What is the practical application of the results of the work?
3. What have other researchers done on this topic?
4. What is the novelty of the results of the work?
5. What are the advantages of the results obtained in comparison with known analogues?

After the presentation of all the dissertations, the SEC holds a meeting at which it discusses and approves the assessments. This procedure takes place without the participation of students. With the permission of the Chairman of the SEC, scientific supervisors, consultants or representatives of the educational department (dean's office) may participate in the discussion of assessments.

After discussion and approval, applicants are invited to the audience of the SEC meeting, where the assessments are announced.

The student has the right to file an appeal based on the results of the state attestation test1 about his disagreement with the results and / or about the violation (in the student's opinion) of the procedure for its conduct2.

1 Based on the results of protection

2 See para. "Procedure for..." SMKO MIEA 7.5.1/03.H.30-19.

# RULES OF REGISTRATION OF THE TEXT OF THE DISSERTATION AND ABSTRACT

The presentation of the text and the design of the master's thesis and abstract should be carried out in accordance with the requirements of these Guidelines, GOST 7.32-2001, GOST 2.105-95 and GOST 6.38-90 (Unified documentation systems. System of organizational and administrative documentation. Requirements for the preparation of documents), Recommendations for the design of written works of students on educational bachelor's, specialist and master's degree programs (SMKO MIREA 7.5.1/03.P.69-16). The pages of the text of the master's thesis and the illustrations and tables included in it must correspond to the A4 format according to GOST 9327-60 (Paper and paper products. Consumer formats).

Handwritten versions of the thesis and abstract are not accepted for consideration.

The text of the dissertation and abstract (including formulas and symbols) must be made using a computer and printed on a printer in the mode of one-sided printing. For the preparation of the text, it is allowed to use any text editor that provides the following parameters:

font – Times New Roman; size – 14 pt;

line spacing – one and a half; font color – black;

page margins: left – 25 mm, right – 15 mm, top and bottom – 20 mm; alignment – in width;

paragraph indentation – 1.25 cm.

The volume of the abstract is not more than 5-6 pages.

The volume of the master's thesis is, as a rule, 80-100 pages of A4 format. Recommended distribution of the volume of the text part into sections:

Abstract – 1-2 pages Introduction – 3-4 pages.

The first section (literature review) - 25-30 pages, conclusions on 1 section - no more than 2 pages.

The remaining sections of the main part are 30-60 pages, the conclusions for each section are no more than 2 pages.

Conclusion – 2-3 pages.

The scope of the sections "Normative references", "Content", "List of abbreviations and definitions", "List of used literature" and "Annexes" is not regulated.

## Headings

Each section starts with a new page. The title of the section is written in the usual (not bold) font, size 14 pt, alignment in width, without underlining, paragraph indentation 1.25 cm. The period after the number and at the end of the section title is not put. If the title contains two sentences, they are separated by a period. The text of the section is separated from the heading by an empty line. The title of the section should be as brief as possible, but it should necessarily reflect the main content of the section.

|  |  |
| --- | --- |
| **EXAMPLE** | **Wrong**:Section 1. Literature review 2. Theory.**Correct:**1. Granular ferroelectrics: main properties and application (literature review)
2. Calculation of the effective dielectric current in the case of different

forms of ferroelectric granules |

Subsection titles are printed in plain (not bold) type, without underlining, paragraph indentation 1.25 cm, alignment to width. The text of the subsection is separated from the title by an empty line. Subsections are numbered within the main section. There is no period after the subsection number and at the end of the title. Sections, like subsections, can consist of one or more paragraphs. If the section contains only one subsection (or there is only one paragraph in the subsection), it is not numbered.

|  |  |
| --- | --- |
| **EXAMPLE** | 1. Thin ferroelectric films: main properties and application (literature review)
	1. Basic properties of nanoscale ferroelectrics
	2. Methods of obtaining thin ferroelectric films
		1. Methods of deposition from solutions
		2. Sol-gel technologies

... |

## Page numbering

The page number is placed in the middle of the bottom of the sheet, without a period. Page numbering begins with the cover page, and the number is not affixed to it. Numbering is throughout the text, including the abstract, illustrations on individual pages and annexes.

## Lists

Single-level lists can be numbered or bulleted, and you should avoid complex bullets that may be lost or distorted when printing. Arabic numerals are used to create a numbered single-level list.

We recommend that you create multi-level lists in a hierarchical setting

"number – letter – hyphen", for example:

1) хххххххххх

 a) ххххххххх

 - хххххххх

 - хххххххх

 b) ххххххххх

 - хххххххх

 - хххххххх

When forming a two-level list, letter designations are usually omitted and the "number - hyphen" scheme is used.

## Illustration

Drawings, graphs, diagrams, schemes, illustrations placed in dissertations must meet the requirements of state standards of the Unified System of Design Documentation (ESKD).

Illustrations are placed in the text of the dissertation immediately after their first mention (links), or on the next page. When placing pages in the text should be separated from the text by a blank line and at the top, and from below. When preparing text in the editor MSWord options should be used Layout Options - Text Wrapping - Top and Bottom or Options menu Markup – Wrap Text – Around frames» at Condition A what Width scope Matches с Width Text. Big (more 50% Square pages) drawings can be placed on a separate page. Drawings, diagrams and other illustrations made on sheets of A3 format should be given in the appendix with the appropriate reference in the text of the dissertation.

Illustrations should be in computer version, in black and white or color. If the paper version of the thesis is supposed to be printed in black and white, it is recommended that all illustrations be made in black and white in the electronic version. An exception is made for special data, such as, for example, the readings of the recorder. In this case, illustrative materials can either be scanned and then inserted into the text in the format of the figure, or pasted on a blank sheet, which is numbered in the same way as the rest of the dissertation sheets. The caption to such a drawing is performed in a computer way. In the electronic version of the dissertation, all such illustrations should be presented in scanned view.

All illustrations should be described in the text of the dissertation with appropriate references to them. The numbering of the drawings in the text of the dissertation should be through each section, including the annexes. The figures are numbered in Arabic numerals according to the scheme "section number - point - picture number". Drawings in the annexes are numbered according to the scheme "application number - point - figure number". For example, the figures in section 1 are numbered as "Figure 1.1, Figure 1.2, ...", and the drawings in Appendix A should be numbered as "Figure A.1, Figure A.2, ...". If all the figures are in the same section, you can use the designations "Figure 1, Figure 2..."

References to the figures in the text should be given at their first mention, without abbreviations. In the Russian-language literature, it is not customary to use the signs "figure 1", "Figure 1", which are a direct transliteration of the English-language term. If the picture contains several panels, they should be used. additionally number (a), (b), (c), etc.

|  |  |
| --- | --- |
| **EXAMPLE** | **Wrong**:Fig. 1.5 are dependencies...Temperature dependence (Fig. 5) allows you to determine...In the last picture, as in the very first, the dependence has a linear character...The upper left figure illustrates...**Correct:**Figure 1.5 shows the dependencies...Temperature dependence (Figure 5) allows you to determine...In Figure 1.6, as in Figure 1.1, the dependence is linear... Figure 5(a) illustrates... |

The signature is placed immediately because of the picture, in the center, the size and type of font should coincide with the parameters of the main text. Above, the underlying text is separated from the caption to the picture by an empty line. Pictures and their captions are not highlighted.

Graphs and diagrams are performed in a computer way. The combination of computer and handwritten methods is not allowed, but it is allowed to make handwritten notes on pasted illustrations (data of the recorder, etc.).

When plotting graphs in black and white, you should choose the designations of points and lines that allow you to uniquely identify the data. For ease of description, you can use letter or numeric symbols of curves on one graph. Captions to the axis should be made in Russian language, except in cases of citation of data from literary sources.

|  |  |  |
| --- | --- | --- |
| **EXAMPLE** | **Wrong**: | **Correct:** |
| **EXAMPLE** | **It is permissible**: | **Acceptably:** |

In the latter case, both in the caption to the figure and in the text, it is necessary to give a link to the source. An example of the design of the picture in the text of the dissertation is given in Appendix D.

The graphs must necessarily indicate the values of errors along the axes, except for cases when the error value is less than the size of the points of the graph. In nonlinear graphs of complex shape or graphs containing a large number of points, it is allowed to specify only errors in the characteristic points of the curve or the maximum error at the corresponding point. It is allowed not to indicate the error on the graph if it is less than 5%, but information about this must be placed in the text or in the caption to drawing.

It should be remembered that the automatic connection of experimental andcheck with straight lines "for clarity" in most cases is an error, so it is not allowed. If necessary, you should approximate the experimental data within the framework of the model under discussion manually, or using special software. The exception may be the dependence of a complex form ( e.g. spectrum) that is not subject to approximation and/or contains a large number of experimental points.

## Table

The table is located immediately after the text in which it is mentioned for the first time, or on the next page. The name of the table should be as concise as possible and reflect its contents. The name is placed above the table on the left, without paragraph indentation.

Tables, with the exception of annex tables, are numbered in Arabic numerals within the section. The table number consists of a section number and a table sequence number separated by a period (for example, "Table 1.1"). The tables of each annex are indicated by a separate numbering in Arabic numerals with the addition of the annex designation before the digit ("Table A.1").

If there is one table in the document, it should still be marked

"Table 1.1" or "Table A.1" if it is shown in Annex A. Columns and rows of the table are limited to solid lines of thickness

0.1 mm (1 pt).You can use the font size of 12pt and 10pt to save space in thetable. It is not allowed to separate headings and subheadings in columns and rows of the table with diagonal lines. Column headings, as a rule, write parallel to the rows of the table. If necessary, you can use a perpendicular arrangement of graph headers.

The design of tables in the dissertation must comply with GOST 1.5-2012 (Standardization in the Russian Federation. National standards. Rules for the construction, presentation, design and designation (with amendment, with Change N 1) and GOST 2.105-95 (Unified system of design documentation. General requirements for text documents).

|  |  |
| --- | --- |
| **EXAMPLE** | Table 1.1 – Values of DFP sections of fluorescein in aqueous solution and in ethanol presented in the literature |
|  | Dye | Solvent | Conc.106 M | Cross-section DFP, GM | vozb, nm | Source |  |
| Fluorescein | pH 11 | 1 | 54 | 800 | [46] |  |
| 80 | 38  9,7 | 782 | [62] |  |
| pH 13 | 80 | 36 | 800 | [42] |  |
| Fluorescein | Ethanol | 10 | 170 | 797 | [58] |  |
| 10 | 75 | 814 | [58] |  |
|  | 100 | 782 | [63] |  |

## Formulas and equations

Equations and formulas should be separated from the text into a separate line. At least one free line must be left above and below each formula or equation. If the equation does not fit into one line, it must be carried over after the equal sign (=) or after the plus sign (+), minus (–), multiplication(),division (:), or other mathematical signs, and the sign at the beginning of the next line is repeated. All formulas are performed computer-based. Handwritten writing of formulas, symbols and symbols in the text are not allowed. The font size for formulas is set for the best clarity and clarity of the formula.

The explanation of the values of symbols and numerical coefficients should begiven directly below the formula in the same sequence in which they are given in the formula. Formulas in the report should be numbered ordinal numbering within the parenthetical section in the rightmost position on the line. The formula number is based on the principle of "section number - point - formula number". References in the text to the serial numbers of formulas are given in brackets (see example). Formulas placed in annexes are numbered separately in Arabic numerals within each annex with the addition of an application designation before each digit, for example, "formula (A.1)".

|  |  |
| --- | --- |
| **EXAMPLE** | ... the second component in equation (2.1) describes quadrupole polarization (2.2)where  component of the quadrupole susceptibility tensor.  |

## Application

Applications are arranged and numbered in order of references to them in the text of the dissertation after the list of sources used. Each application begins with a new page. The title of the application is formed according to the template:

|  |  |
| --- | --- |
| **EXAMPLE** | Appendix A.List of publications on the topic of the dissertation (Text of the appendix from the red line with alignment to the width) |

The title is written in the same font as the main text, without paragraph indentation with center alignment. The format of the text of the application coincides with the format of the main text of the dissertation, with the exception of tables and texts of programs. Page numbering of applications is included in the general end-to-end page numbering.

Appendices are indicated by capital letters of the Russian alphabet, starting with A, with the exception of the letters Yo, Z, Y, O, CH, Ь, Y, Kommersant. If there is only one appendix in the dissertation, then it is designated "Appendix A". As an appendix, it is recommended to provide a list of publications on the results of the dissertation prepared by the author personally or in co-authorship, including articles, conference abstracts, patents, etc.

If the thesis does not contain annexes and there are no publications onresults of the dissertation, then this section is excluded from the dissertation, table of contents and abstract.

## List of sources used

The list of sources used should be formed in the order of mentioning sources in the text of the dissertation; the list is numbered in Arabic numerals without brackets, quotation marks and other markers, with alignment in width. The reference to the source in the text of the dissertation is indicated in square brackets. When referring to the author of the cited work in the text of the dissertation, his name is indicated in the Russian transcription.

|  |  |
| --- | --- |
| **EXAMPLE** | **Examples of** **source** **links** **in** **text**The work [2] shows that... For the calculation, the parameters given in Article [7] were used.As has been shown in the works of Chen et al. [24-26], this effect depends on... Thus, the Greenberg method [3] is optimal for... |

Examples of references to the sources used are given in Appendix D.

Links to the sources used, as well as the "Contents" section, can be formed using the capabilities of a text editor. Including, with the help of macros.

## Order of binding of the work

In a printed copy of the dissertation are sewn (in order of succession):

1. title page;
2. the original task for the final qualifying work of the master (master's thesis);
3. abstract;
4. Contents
5. regulatory references (if any);
6. definitions, designations and abbreviations (if any);
7. Introduction;
8. the main part of the dissertation;
9. conclusion;
10. list of cited literature;
11. applications (if any).

An envelope with a CD or other electronic medium is glued to the flyleaf of the printed copy in accordance with the requirements of the SEC with the materials recorded on it, the list of which is given in paragraph 2.9 of these guidelines.

Originals of the reviewer's review (1 copy) and supervisor (1 copy), as well as a certificate of checking the text for borrowings (1 copy) are attached to the printed copy.

# MANAGEMENT OF FINAL QUALIFICATION WORK

A student performing a dissertation work is appointed a supervisor from among the teachers of the departments (usually graduating) of the Institute of Physics and Technology. The student may also be appointed a consultant on the topic of the final qualifying work (master's thesis). A consultant on the topic can be a teacher, a researcher, an engineer (a specialist with higher education), working directly in the unit in which the qualification work is performed. Researchers from external research organizations, design bureaus, as well as employees of industrial enterprises with sufficient qualifications can also act as a consultant (if necessary). In some cases, the duties of the consultant may be assigned to the supervisor.

The duties of the head include clarifying the wording of the topic, drawing up an assignment, developing a general research strategy together with the student, approving the work plan. The supervisor is obliged to advise the student on issues arising in the process of working on the dissertation. The consultant on the topic of the dissertation advises on issues related to the direct implementation of experimental, design, etc. tasks, the solution of which is required in the course of work on the dissertation.

It is important to keep in mind that the supervisor and consultants are neither co-authors nor editors of the qualifying work, so the student should not count on the fact that the head or consultant is obliged to correct the spelling, stylistic and other errors in the final qualifying work, provide information, provide translation, perform calculations, etc.

After receiving the final version of the dissertation, the supervisor, taking into account the opinion of the consultants, makes a written review. The following points must be reflected in the review:

* the degree of realization of the goal set for the student;
* the degree of independence in writing a master's thesis, the level of theoretical training of the author, his knowledge of the basic concepts and scientific literature on the chosen topic, his attitude to the work;
* the level and composition of competencies acquired by the student in the process of performing the work.

At the same time, the head does not rate the work, but only gives a qualitative characteristic of the student's work on it and recommends or does not recommend its author for admission to graduate school.

# REVIEWING THE DISSERTATION

Master's theses are subject to mandatory review.

As reviewers, teachers, scientific and scientific-technical workers of RTU MIREA, other universities, scientific organizations can be involved. When developing devices of different types, as well as technological principles and methods, it is possible to involve representatives of industrial production with appropriate qualifications as reviewers during the dissertation work. It is not allowed to involve as reviewers employees of the same unit where the master's thesis was performed, teachers and employees of the graduating department.

The following points should be noted in the review:

* relevance of the topic;
* the main problems considered in the master's thesis;
* theoretical and practical significance;
* characteristics of the main sections of work with the allocation of positive aspects and, necessarily, disadvantages.

The conclusion indicates whether the work meets the requirements, what assessment it deserves. The review is signed by the reviewer indicating his academic degree, academic title, position and place of work. The signature of the reviewer, if he is not an employee of MIREA, must be certified by an authorized representative of the personnel service at the place of work of the reviewer.

# TERMS OF DEFENSE OF THE MASTER'S THESIS

The date of protection is determined by the order of the rector of the University in accordance with the curriculum of the direction of training in which the student is studying. The usual period of defense of the master's thesis at the Institute of Physics and Technology is no later than June 30. Pre-defense usually takes place 5-7 days before the defense.

# APPENDIX A

Example of registration of the title page of the master's thesis

|  |
| --- |
|  |
| MINISTRY OF EDUCATION AND STAUES OF RUSSIA |
| Federal State Budgetary Educational Institution of Higher Education**MIREA –** **Russian** **Technological** **University****RTU MIREA** |
| Institute of Physics and TechnologyDepartment of Solid State Electronics |

|  |
| --- |
| **WORK IS ALLOWED** **TO** **BE PROTECTED** |
| Head of the Department |
|  Y.P. Nevstruev« » 202 g. |

**FINAL QUALIFYING** **WORK**

**(*master's*** ***thesis*)**

In the direction of training masters 11.04.04 – Electronics and nanoelectronics

On the subject: **SOLUTION OF** THE **AUERS** **PROBLEM** **IN MATERIAL** **SUBSETS**

|  |  |  |
| --- | --- | --- |
| Learning | *signature* | Oira-Yira Roman Petrovich |
| Cipher | EEM-001320 |  |  |
| Group | EEMO-01-20 |  |  |
| Head of Work | *signature* | d. f.-m. n., professor | Kivrin F.S. |
| Consultant | *signature* | Ph.D., researcher  | Privalov A.I. |
| Reviewer | *signature* | Doctor of Technical And Technical, Head. Department of research institute FAQ RAS | Junta K.H. |

MOSCOW 2022

# ANNEX B

Example of writing an essay of a master's thesis

Abstract

The thesis contains 84 p., 24 fig., 4 tab., 44 sources, 2 pli. Keywords: thin films, ferroelectrics, dynamics of parameters,

Modulators

The relevance of the proposed study is due to... The object of the study are....

The purpose of the work is .....

To this end, as a result of the *work, the main provisions have been developed...* *experimental* *samples were made...* *proposed* *models that* *allow... theoretical calculations are carried* *out....*

Based on the results *obtained, a layout of the... parameters are calculated... an* algorithm is *proposed...*

The novelty of the results obtained lies in...

The results of the dissertation work can be used for... Approbation of the results was carried out *on* the scientific *and technical* conference *-*

*... scientific* *seminar...*

\*Based on the results of the work published ... articles in Russian and foreign magazines, from them ..... articles in journals indexed by Web of Science and Scopus3.

\*The implementation of the results of the dissertation work was carried out in...

\*Based on the results of the dissertation *work, an application for a patent was filed... registered* *computer program...* *an* *application for a* utility model has been *submitted...*

\*The results of the dissertation work were awarded *with a diploma of the* *conference... medal of the* *exhibition... Prize of the* *Government of the Russian Federation...*

\*The work was carried out on the equipment of *the Center* *for* Collective *Use... Scientific and educational* *center...*

\*The work was done within the framework of the grant...

3 Items marked with an asterisk are optional and are given only if the specified information is available.

# APPENDIX B

Example of registration of the title page of the abstract of the master's thesis

|  |
| --- |
|  |
| MINISTRY OF EDUCATION AND STAUES OF RUSSIA |
| Federal State Budgetary Educational Institution of Higher Education**MIREA –** **Russian** **Technological** **University****RTU MIREA** |
| Institute of Physics and TechnologyDepartment of Solid State Electronics |

Oira-Yira Roman Petrovich

**SOLVING THE POWERS** **PROBLEM** **IN** **MATERIAL** **SUBSETS**

Direction of training 11.04.04 Electronics and Nanoelectronics Master's program "Technologies of perspective element base microi nanoelectro-

niki"

**Abstract of master's thesis**

|  |  |  |
| --- | --- | --- |
| Scientific supervisor | Doctor of Physical and Mathematical Sciences, Professor | F.S. Kivrin |

MOSCOW 2022

# APPENDIX D

Example of drawing design in the text of the dissertation

TEXT \*\*\*

Experimental data of parameter *B* depending on parameter *A* for two samples were obtained. The results are shown in Figure 2.5.

*(empty string)*



Figure 2.5 – Dependence of parameter *B* on parameter *A* for samples 1 and 2.

Solid line – approximation within the selected model.

*(empty string)*

TEXT \*\*\*

**Attention!** The pop-up is shown for an example of selecting markup options in MSWord.

# APPENDIX D

Example of the design of the list of used sources

List of sources used

1. Reference to the book, if there are no more than three authors:

Druker P. Classic works on management. – M.: Moscow School of Management "Skolkovo": Alpina Business Books, 2008. -220 p.

Klimov G.A. Methods and means of testing products of electroradio products for reliability: Uchebn. Manual: In 2 t. – M.: Technosphere, 2004.

1. Link to the book if there are more than three authors:

Designing electronic means / Vasiliev K.R. et al. – M.: Technosphere, 2004. – 420 p.

1. Reference to the reference manual, methodical materials:

Systems of computer-aided design of radio-electronic means: Reference manual of the designer / A.M. Pavlov, K.P. Borisov et al.; pod general. ed. P.N. Savelyeva; Press. – 1992. – 820 p.

1. Link to conference materials:

Dmitrieva T.G., Kitaev V.V., Miroshnichenko A.A. Local atomic and magnetic structure of amorphous alloys / International Scientific and Technical Conference "Fundamental Problems of Radio-Electronic Instrumentation" (INTERMATIC-2011) November 13– 17, 2011 Moscow, p.45-49.

1. Link to the article from the journal:

Makarova N.S. Model of the system of ensuring the competitiveness of the enterprise of the radio-electronic complex of Russia in modern economic conditions // Scientific Bulletin of MIREA. – 2011. – №5. – p.18-24.

Lei H., Wang H.Z., Ren Y., Fang Q., Zheng X.G., Wei Z.C., Xu N.S., Jiang M.H. Temporal and spectral behaviors of two-photon induced emission laser dyes // Opt. Commun. – 2001. – v. 187. – p. 231–234.

1. Link to dissertation abstract:

Kanevsky V.E. Quality assurance system for semiconductor materials for quantum and optoelectronics devices based on CALS-technologies: Autoref. dis. ... Cand. techn. Nauk / MIREA. – M., 2010. – 16 p.

1. Link to the Internet resource:

Lecture by Professor Michael Graetzel at Moscow State University. "The Rapid Rise of Perovskite Solar Panels", April 12, 2016 [URL:http://www.nanome-](http://www.nanometer.ru/2016/04/16/14608051177549_521554.html)  [ter.ru/2016/04/16/14608051177549\_521554.html](http://www.nanometer.ru/2016/04/16/14608051177549_521554.html) (retrieved 08.01.2018, 22:01).

Newsletter"Perst – Promising Technologies": electron. Journal. 2017. t.24, vyp. 20/22. URL  [http://perst.issp.ras.ru/Control/In- form/perst/2017/17\_21\_22/index.htm](http://perst.issp.ras.ru/Control/Inform/perst/2017/17_21_22/index.htm) ( retrieved 08.01.2018, 17:09).

Kr-Ion Laser Mirror. Overview / [ THORLABS website] [URL:http://www.thorlabs.de/newgrouppage9.cfm?objectgroup\_id=807](http://www.thorlabs.de/newgrouppage9.cfm?objectgroup_id=807) ( retrieved 2018-01-08, 21:21).