

## I. IDENTIFICATION DATA

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| <b>Thesis title:</b>          | Experiment a modelování jevu čtyřvlňného směšování u optických DWDM síti   |
| <b>Author's name:</b>         | <b>Bc. Sana Rebwar Mohammed</b>  |
| <b>Type of thesis:</b>        | master   |
| <b>Faculty/Institute:</b>     | Faculty of Electrical Engineering (FEE)  |
| <b>Department:</b>            | Department of Telecommunication Engineering  |
| <b>Thesis reviewer:</b>       | Ing. Jan Látal, Ph.D.  |
| <b>Reviewer's department:</b> | VSB-Technical University of Ostrava, Faculty of Electrical Engineering and Computer Science, Department of Telecommunications, 17. listopadu 15, 708 00 Ostrava-Poruba |

## II. EVALUATION OF INDIVIDUAL CRITERIA

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| <b>Assignment</b>  | <b>challenging</b> |
| <i>How demanding was the assigned project?</i>   |                    |
| The task in this thesis belongs to the more difficult, in my opinion. The Student has to combine knowledge from several fields, such as photonics, digital signal processing, etc. and then applies it to simulation models related to the topic of the thesis. From my point of view, it is a complex thesis that deals with problems of non-linear effects based on FWM in DWDM networks. The Student was dealing with FWM in regard to laser's input power, channel spacing, fiber reach and dispersion in an optical fiber through simulations. By using the RSoft optSim software, models that were subsequently validated through practical measurements were created. |                    |

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| <b>Fulfilment of assignment</b>   | <b>fulfilled</b> |
| <i>How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.</i> |                  |
| The diploma thesis fulfils the assigned task entirety, all primary goals have been achieved. I don't have any reminders here.   |                  |

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| <b>Methodology</b>   | <b>correct</b> |
| <i>Comment on the correctness of the approach and/or the solution methods.</i>   |                |
| The student has chosen correct procedures for all individual practical parts, as well as for the simulation models. This is also evident in overall thesis processing. I don't have anything to reproach at this given point. I very much appreciate the fact that the student presents a very good overview conclusion of his thesis. |                |

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| <b>Technical level</b>  | <b>A - excellent.</b> |
| <i>Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?</i>  |                       |
| In my opinion, the chosen simulation methods are suitable, and the technical level is also appropriate. In the simulation part as well as in the practical part used procedures and outputs of the thesis are clearly obvious. The used simulations are well described and introduced, the selected models and input parameters in the thesis are followed by graphical outputs. In the practical part, the experiment is introduced, and the results obtained from the simulations are compared with, real measurements and subsequently, optimization of solution for the FWM influence on DWDM systems is presented. On the other hand, what I lack, is that the student did not present any figure from the practical measurement, where the experimental setup used could be seen. |                       |

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| <b>Formal and language level, scope of thesis</b>   | <b>B - very good.</b> |
| <i>Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?</i> |                       |

The language level is good, with respect to the fact that it is written by a non-native English language speaker. I did not find any principal mistakes or unclear expressions. The quality of the used figures is very good. As a minor shortcoming I could consider typographical errors in subscripts or superscripts, or incorrect presentation of some Greek symbols used in the work (e.g. page 5). In Fig. 7.2 or further, the dimension is given, but not the parameter (power).

### **Selection of sources, citation correctness**

**A - excellent.**

*Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?*

The student used technical literature correctly (mainly scientific articles from IEEE, SPIE, OSA, etc.) in the thesis, and the used resources are up to date. The author's statements and original results are sufficiently distinguished from the used resources, except for the figures.

### **Additional commentary and evaluation (optional)**

*Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.*

The thesis consists of a general overview of the investigated topic, which is very carefully prepared, and the overview of a number of technical papers. In the practical part, the student presents the results obtained from both simulations and measurements, and then evaluates the results properly. Considering the practical part, the student performed the measurements that could be the basis for further, more sophisticated measurements in the future.

## **III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE**

*Summarize your opinion on the thesis and explain your final grading. Pose questions that should be answered during the presentation and defense of the student's work.*

The grade that I award for the thesis is **A - excellent**.

The diploma thesis is prepared adequately. The student has demonstrated her independent **engineering skills** in the process. The Student Sana Rebwar Mohammed has submitted a very good thesis which I **recommend** for **defence** and to award the degree of "Master of Science (*Engineer*)" after completing the state final examinations.

The following are the questions for discussion:

- 1) How much can different types of compensation fibers affect the excitation of FWM in fibers?
- 2) Can FWM be used in fiber optic communications for anything beneficial? Can this phenomenon be advantageous in some cases?
- 3) For UDWDM, the occurrence of FWM is an undesired phenomenon, but is it a major one?
- 4) What are some disadvantages of optical amplifiers in photonic communications?

Date: **9.6.2023**

Signature: