THESIS REVIEWER'S REPORT

I. IDENTIFICATION DATA

Thesis title:	**Non-linear Four-wave Mixing in DWDM Systems**
Author's name:	**BSc. Aldair da Costa Baptista**
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Telecommunication Engineering
Thesis reviewer:	Ing. Jan Látal, Ph.D.
Reviewer's department:	VSB-Technical University of Ostrava, Faculty of Electrical Engineering and Computer Science, Department of Telecommunications, 17. listopadu 15, 708 33 Ostrava-Poruba

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment **ordinarily challenging**

How demanding was the assigned project?

In general, I consider the objective of this thesis as difficult. Student had to combine knowledge of several fields as well as to perform related simulations and real measurements. It was necessary to study non-linear DWDM systems phenomena according to changes of key technical parameters.

Fulfilment of assignment **fulfilled with major objections**

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.

Based on my review, the objectives of this theses were not fully fulfilled. The author claims in the text that health issues were one of the reasons, which is an information that cannot be verified from my side, neither the impact of this issues on presented work. The simulations and practical experiments could be improved with better presentation of the results, more figures could be included. Practical work was reduced to basic measurements.

Methodology **partially applicable**

Comment on the correctness of the approach and/or the solution methods.

Used methodology is good, however I have a few concerns about the simulations, e.g. a default OptiSim model was used, and it is not clearly stated if the other models were created by the author or they were taken over. The results are presented in many figures, but if some of them were combined and compared in a single plot, the understanding for a reader would be easier.

Technical level **C - good.**

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?

Technical level is good, student uses known terminology related to its work. However, his expression and presenting skills are poor.

Formal and language level, scope of thesis **D - satisfactory.**

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?

Thesis language level is good with respect that it was written by a non-native English speaker. I found some mistakes and unclear expressions. Czech abstract is very clumsy, probably because of using some free online translator service. My main concern is related to unexplained abbreviations and equations variables. Some figures and tables are wrongly referenced. The quality of some figures adopted by student significantly differ, a few of them are on the edge of readability.

Selection of sources, citation correctness **C - good.**
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?
Student correctly used technical literature (mainly scientific articles from IEEE, OSA, etc.) in thesis and the sources are up to date. Author thoughts and original results are sufficiently distinguished from used sources except figures. Student used different citation standards for used sources within the thesis. This should be unified.

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.
In the beginning of the thesis, an introduction to the topic is presented. In practical part student shows results obtained by simulations and experiments. He also provides conclusion for his findings. However, not all measurements were performed (due to lack of time caused by health issues, as stated in the thesis's conclusion). The simulations could be made better, too. I consider the topic non-linear phenomena in DWDM systems itself as very interesting, but the author hasn't achieved fully satisfactory results and the presentation of the work in the text is also not very good.

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 **D - satisfactory.**

The thesis is sufficiently elaborated, and the student demonstrated ability of independent engineering work. Mr. Aldair da Costa Baptista worked out a **good diploma thesis** that **I recommend for the defense** and at the same time, I present some possible questions for discussion and these questions have to be answered:

1.) Is possible to use a SOA amplifier in DWDM system? Is possible to observe non-linear four-wave mixing effects in DWDM?

2.) Why 1550 nm wavelength shows lower values of attenuation then for other wavelengths? What is it depending on?

3.) Please, explain in detail a term "linear optical amplifier".

4.) Which non-linear effect has major impact on communication in DWDM system and why?

5.) With increasing number of channels in photonics communication the problem with range so optical amplifiers are being used. There are different types of the amplifiers (semiconductors of fiber based on some rare dopants) and locations in the photonics path. In addition, these optical amplifiers can have different types of pumping source. Do these changes/types in configurations of optical amplifiers have any significant impact on generation of non-linear effects? Can be seen any changes in spectrum channels/signals?

6.) In chapter 6.2 you stated that a 4-channel DWDM system was used in the simulation. Please, specify wavelength and explain working principle and parameters of the component "grating_ideal1".

Date: **24.8.2020** Signature: