

I. IDENTIFICATION DATA

Thesis name:	Simulation of Large-Scale Optical Transmission Systems
Author's name:	Bc. Kevin James Aguilar
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Circuit Theory
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	challenging
<i>Evaluation of thesis difficulty of assignment.</i>	
<p>The task in this thesis belongs to the more difficult, in my opinion. A student has to combine knowledge from several fields for example photonics, digital signal processing, etc. and then applies it in simulation models related to the topic of the thesis.</p> <p>From my point of view, it is a complex thesis dealing with problems of optimization of future generations photonic networks. A student ought to study and analyze possibilities of signal transmission using new types of modulation formats based on PM-m-QPSK or PM-m-QAM in xWDM systems for Large-Scale Optical Transmissions with different spacing between channels and other parameters.</p>	

Satisfaction of assignment	fulfilled
<i>Assess that handed thesis meets assignment. Present points of assignment that fell short or were extended. Try to assess importance, impact or cause of each shortcoming.</i>	
<p>Based on the study in the thesis of Mr. Aguilar, I can state that all the tasks of the diploma thesis are fulfilled. In the practical part of the thesis, the problem of large-scale optical networks simulation is investigated with the aim of achieving an optimal OSNR against increasing transmission capabilities of a given network by xWDM channeling with different channel spacing. An integral part of the study was finding suitable modulations with respect to BER or Q-factor in nonlinear phenomena/effects in optical fibers. The introduction part of the thesis seems to be quite long and detailed. The student also worked carefully with the references from which he draws lots of interesting knowledge and uses it in his thesis, and then in the simulations. In the theoretical part, I just have to point out that it should have been completed by Chapter 4.2.2.; the next chapters has already fulfilled the student's contribution, i.e. progress in design of networks and other components used in the simulations and their evaluation.</p>	

Method of conception	outstanding
<i>Assess that student has chosen correct approach or solution methods.</i>	
<p>The student has chosen some correct procedures for all individual practical parts, as well as for simulation models. This is also evident in overall thesis processing. I have nothing to reproach for this given point. I very much appreciate the fact that the student presents a partial conclusion after each part of his thesis.</p>	

Technical level	A - excellent.
<i>Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.</i>	
<p>Professional level of thesis is excellent. The student uses technical terms correctly, referred to a given topic, and therefore sufficiently proves that he is able to use scientific resources.</p>	

Formal and language level, scope of thesis	A - excellent.
<i>Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.</i>	

Thesis language level is excellent, considering the fact that it is written by a native speaker. I did not find any fundamental mistakes or unclear expressions. The quality of used figures could be better.

I have to reproach the student a little bit for the chosen type of simulated data processing; sometimes it is very difficult to follow individual dependencies. In this case, it would be better to export a data file with the values and then process them into clearer graphs, e.g. by using MATLAB for better readability. Please, do not use the star sign for the multiplication operation. In mathematics, this character has a different meaning or explanation. On page 2, you define the specific fiber attenuation SSMF 0.2 dB / km, no reference is given; on page 3, does α define attenuation?; page 4 - the subscript for SiO₂ is missing.

Selection of sources, citation correctness

A - excellent.

Present your opinion to student's activity when obtaining and using study materials for thesis creation. Characterize selection of sources. Assess that student used all relevant sources. Verify that all used elements are correctly distinguished from own results and thoughts. Assess that citation ethics has not been breached and that all bibliographic citations are complete and in accordance with citation convention and 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 figures.

Additional commentary and evaluation

Present your opinion to achieved primary goals of thesis, e.g. level of theoretical results, level and functionality of technical or software conception, publication performance, experimental dexterity etc.

The thesis contains a general overview of the solved problem in the introduction part. In the practical part, the student presents the results obtained from simulations models of Large-Scale Optical Transmission Systems, and all the results are very well described and explained in the thesis. The student also created and evaluated many simulation models, which are the basis for more sophisticated simulations in future works (for example his Ph.D. work).

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

Summarize thesis aspects that swayed your final evaluation. Please present apt questions which student should answer during defense.

I evaluate the submitted thesis with classification grade **A - excellent**.

The thesis is sufficiently elaborated and the student demonstrated ability of independent engineering work. Mr. Kevin James Aguilar worked out a **very interesting diploma thesis** that **I recommend for the defense** and at the same time, I present some possible questions for discussion:

- 1) Which type of nonlinear phenomena/effects will be the first to arise in case of increasing the number of channels in the xWDM system and why?
- 2) How is ASE noise generated when using the Er³⁺ based fiber amplifier (EDFA)? In what direction is this noise propagating?
- 3) Do you think that with the use of super-channeling and the increasing power density in the fiber, the degradation of optical fibers by aging can occur faster?

Date: **9.6.2019**

Signature: