I. IDENTIFICATION DATA

Thesis title:	**Coexistence of optical systems on a physical layer**
Author's name:	**Milan Chvalina**
Type of thesis:	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Electromagnetic Field
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 2172/15, 708 33 Ostrava-Poruba

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	**challenging**

How demanding was the assigned project?

In general, I consider the objective of Mr. Chvalina's thesis as difficult. The Student had to combine knowledge from several areas the field of optics. The simulation model of xWDM systems seems to be the main challenge to deal with. It was necessary to study non-linear DWDM systems phenomena according to changes in key technical parameters.

Fulfilment of assignment	**fulfilled**

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.

The thesis task was dealing with simulation of concurrent operation of more optical systems over common physical link at different traffic loads. Student had to design models with reach around 400 km allowing various bitrates (10, 20, 40 Gbit/s) in the RSoft OptSim. In these models, it was necessary set carefully signal modulation, wavelength multiplexing type (with spacing according to ITU-T or power level) and regeneration with regards to BER parameter, Q-factor, spectral analysis, etc. There was also a task to simulate a hybrid network topology according to the ITU-T standards that would allow coexistence of several optical systems operating over the same physical layer. The submitted diploma thesis fulfils the given assignments completely.

Methodology	**correct**

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

The thesis individual parts and different simulation models were correctly prepared which can be seen in overall thesis elaboration. The Student solved variety of possible bit rate and modulation type settings appropriately, the results are also evaluated adequately in dependence of key communication parameters (BER, Q-factor). I have only one remark, in case of provided information about individual components settings, the information should be provided completely so that the presented models and results could be reproduced and confirmed by another person or by using a different simulation tool.

Technical level	**A - excellent.**

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?

The Technical level is good, the student uses well known terminology related to his diploma thesis. The Literature resources are often used within the thesis, which enhance its quality in theoretical part. I appreciate very much that the student created simulations on the basis of real values and abide the ITU-T standards. In the following chapters, the student was dealing with designs of individual topologies and models with various bit rates, modulation formats, channel spacing and their mutual interaction with regards to BER, Q-factor and influence of dispersion and non-linear effects. The Results are sufficiently discussed and quality graphical elaboration supplements well the overall thesis impression.

Formal and language level, scope of thesis	**A - excellent.**

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 REVIEWER'S REPORT

Thesis language level is good considering that it was written by a non-native English speaker. Some minor typographical mistakes can be found, but these do not fundamentally spoil the good impression of the work as a whole. I did not find any fundamental errors or unclear statements in this diploma thesis.

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, OSA, etc.) in thesis and the resources are up to date. The Author's thoughts and original results are sufficiently distinguished from used sources including figures. The Student used an unified citation standard for used sources within the thesis.

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 first part of the thesis contains a general overview of solved topic. There are main physical factors influencing transmission quality as well as all measuring parameters with regards to coexistence of various optical systems over one physical link. In the practical part, the student presents results obtained from simulated models of hybrid optical systems and all results are then sufficiently evaluated. In my opinion, the outputs from this thesis are very good and can serve as an appropriate basis for a journal article.

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 thesis is sufficiently elaborated, and the student demonstrated ability of independent engineering work. Mr. Chvalina worked out a **very 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.) Could you please explain the influence of forward and backward noise for a given communication link with regards to quantitative parameters you observed (BER, Q-factor)?
2.) Do you think that it is possible to utilize suitable combination of semiconductor amplifier and doped amplifying fiber for power level amplification of specific spectral range or channels? What advantages or disadvantages would such a hybrid amplifiers interconnection bring?
3.) What is a fundamental disadvantage of optical amplifier (regardless of type) in photonic communications?
4.) In the thesis you have written that Erbium based amplifiers are suitable for signal or spectra regeneration. I agree with that statement, however, what problem are brought, for example, by a cascade connection of these amplifiers into the optical link?
5.) What is the main problem of an optical link connected with change of channel spacing from 100 GHz to more dense spacing of 50 or 25 GHz?
6.) One very important factor for building up long-distance transmission links is solving dispersion effects. Why are chromatic and polarization modal dispersion so important in case of bit rates above 10 Gbps?

Date: **27.5.2021**   Signature: