

I. IDENTIFICATION DATA

Thesis title:	Spectroscopic High Dose Rate Gamma-Ray Detector
Author name:	Bc. Marek Hudec
Thesis type:	diploma
Fakulty:	Fakulta elektrotechnická (FEL)
Department:	Katedra řídicí techniky
Thesis opponent:	Dr. Sascha Reinhardt
Workplace of the opponent:	ENVINET GmbH, Hans-Pinsel-Strasse 4, 85540 Haar

II. HODNOCENÍ JEDNOTLIVÝCH KRITÉRIÍ

Thesis assignment	exceptionally demanding
<i>Evaluate the demandingness of the thesis.</i>	
The thesis assignment is to investigate spectroscopic gamma radiation detectors for the application in high dose rate fields (up to hundreds of mSv/h) and environmental conditions which a normal for the in-situ environmental monitoring.	

Compliance with the assignment	accomplished
<i>Consider compliance of the work with the thesis assignment. Comment on any missing parts or parts extending the assignment. In case the assignment was not fully accomplished, try to review its relevancy and consequences.</i>	
The thesis covers fully the assignment.	

Solution procedure	excellent
<i>Review the methods and procedures selected by the student in order the treat the problem.</i>	
The student first reviews the basic detection techniques which are needed for gamma radiation spectroscopy and identifies the important properties of detector material and electronic. In the next the student gives an overview over the possible materials (scintillators/semiconductors) with the different properties. For the different materials the student carries out Monte Carlo simulation using a software package Geant4. The simulation provides details about the influence of gamma photon energy and also the detector geometry. In the next step the student selected the detector material based on the previous considerations and availability on the market. The detector setup is discussed as well the electronic design. Also the method of measurement is presented and explained. The methods (radiation and temperature measurements) are well selected and described. The obtained results of the temperature and radiation measurements are presented and discussed in relation to the assignment of the work. The change of the properties of the spectrum and the change of deduced values as function of temperature or radiation level is discussed and presented.	

Technical (scientific) quality	B - very good
<i>Review the level of scientific quality, use of knowledge obtained from study and from scientific sources, usage of data.</i>	
The quality of the thesis is very good. The current status of scientific knowledge is investigated and provided in the thesis bibliography. The used knowledge for the thesis is not only the knowledge obtained from study it goes beyond. Many physical aspects are discussed, explained and respected in the work. This additional knowledge is acquired from scientific literature and textbooks. The data are prepared and illustrated very good. For some discussion an uncertainty evaluation of the obtained values may be useful to confirm the discussion (e.g. Figure 7.16 and connected discussion). Also the given conclusions are excellent and serious.	

Formal and language quality, thesis size and its structure	B - very good
<i>Comment on the correctness of terminology and formal notations contained in the thesis. Review the typography and language quality of the work.</i>	
The thesis is well structure and good to read. Even readers which are unfamiliar with radiation detection are guided through the topic very well. The thesis size is well suited to the content and work. The language is good. Sometimes the formulation for physical topics may be not the same as an expert would it be used (e.g. Page 9 "ultimately thin peaks" would be replaced may by with "peaks limited by the natural linewidth"). Overall the used formulations are correct and good. Some references in the thesis are missing (e.g. page 39 "??" and page 50 "??").	

Selection of sources, citation correctness

A - excellent

Comment on activity of the student in terms of obtaining study materials and data from other sources for the purpose of his/her work. Characterize the selection of sources. Evaluate whether the student used all relevant sources. Check if all adopted ideas and elements are correctly distinguished from those of the student's own and that the student followed the rules of citation ethic, the bibliography citations are complete and in accordance to the citation practice and standards.

The student clearly distinctive his ideas from ideas provided in literature. Also the selected literature is well selected and very relevant for the work. Different sources of literature are respected as scientific publication, textbooks, publication from relevant authorities as IAEA and product information from manufactures.

Other comments and rating

Comment the level of achieved main results of the thesis, e. g. the level of theoretical results or functionality and utility of a presented technical solution, the publication outputs, practical skills (experiments) etc.

The achieved results are an outstanding work covering a very difficult topic of gamma spectroscopy in the high dose rate range (several 100 mSv/h). The student shows the possibilities and limits for such detector using the current available technique on the market. The technical solution is the approach to cover all requirements which a given in environmental radiation monitoring as demanded by the market. Also the experimental relation is very well explained and excellent illustrated.

The rating is excellent.

III. OVERALL RATING, QUESTION FOR DEFENSE, CLASSIFICATION PROPOSAL

Summarize aspects of the thesis, that mostly influenced your overall rating. Include your questions for the student that shall be answered during the thesis defense in from of a qualification commission.

The overall rating is influenced mostly due to the complexity of the topics handled in the thesis. Also many topics are not directly related to the study and the student must acquire and use the knowledge additional to the knowledge obtained already during the study.

Questions:

What would he change in a future setup?

For the presented thesis, I propose the following classification degree: **A - excellent.**

Date: May 21, 2015

Signature:

