THESIS REVIEWER'S REPORT

I. IDENTIFICATION DATA

Thesis title:	**Sensor for PCB wrapping measurement.**
Author's name:	Dingyuan Yao.
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Mechanical Engineering (FME)
Department:	Instrumentation and control engineering
Thesis reviewer:	Doc. Ing. Jan Hošek, Ph.D.
Reviewer's department:	Instrumentation and control engineering

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment **challenging**

How demanding was the assigned project?

The goal of the theses was selection a sensor system suitable for PCB wrapping measurement. It suppose to study the problem, making the review research and to propose a proof-of concept setup. It seems to be adequate and slightly challenging for the bachelor thesis.

Fulfilment of assignment **fulfilled with minor 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.

The thesis cover all the topics mentioned in thesis guidelines. I see the problem in correctness of the approach in individual points. On the other hand there was performed some tests on proof-of concept setup, what overcome the original thesis guidelines.

Methodology **partially applicable**

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

I have strong objections to the methodology shown in the thesis. There is not defined what conditions the sensor system has to reach at the beginning. Later on there are some limiting conditions without any discussion. Why the sensitivity has to be 1 µm when mentioned PCB testing requirement is 0.3% of the circuit board length? In case of board 100x100mm the resolution 0.1 mm would be enough. It would lead to looking for completely different sensors much cheaper than selected ones. There is not clear selection process and qualification of individual sensors for desired application. In majority cases the reason for rejection the sensor was limiting working temperature. It is not clear why the confocal sensor was selected when it has the same temperatures working range as other sensors. There is no discussion why the Fiber Bragg Grating displacement sensor was not selected for the application. Capture 5 Design of chromatic Confocal Displacement Sensor System starts with strange sentence without information about design aims or its analytic and synthetic parts.
There is not discussed the optics selection and the proof-of concept setup design is very limited in point of view of optimechanical design.

Technical level **E - sufficient.**

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 poor. I miss the systematic approach to reaching the aims. Individual captures stays alone without clear relation to the next steps of the work. There is not described any selection process. E.g. there are shown two selected lenses for the device without any detail or optimization of the selection. The capture 5.1.1 describes the aspheric lens in general but there is no relation to the lens selection. There is a sentence: The sensitivity of the sensor used this lens is not high in page 32. How the author make this decision? There are mentioned possible errors of the experiment in page 35, but there is not evaluated the uncertainty of the measurement.
The core of the work of the mechanical engineering student is the design of the lens barrel used for experiments and shown in figure 5.13. The is no description of its design and nor the drawing showing knowledge acquired during the bachelor degree level study.
In general the work reached some result, but the thesis description seems to be as the author did something but he had no

idea what he do and why.

Formal and language level, scope of thesis **E - sufficient.**

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?

The thesis quality of presentation and the English level is poor. Some sentences does not have the sense or describes the problem differently from reality. E.g. the interference is described as: "the vibration of some points will always be strengthened". It is strange to have a capture with a single sentence: "Inductive displacement sensor is a newly developed sensor". The content of a paragraph in page 28 seems to be not written by the author. Many parts of the theses are written as somebody tells what has to be done. The text arrangement vary in different parts of the thesis. Some figures have no numbering and description. The references are not cited according citing rules.

Selection of sources, citation correctness **D - satisfactory.**

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 thesis refers to 55 sources, mainly internet pages. There are also referenced books and journal articles, but its citing deviates from standard citing rules.

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.

Why the sensitivity has to be 1 µm when mentioned PCB testing requirement is 0.3% of the circuit board length?
What were criteria for the sensors selection?
The sensitivity of the sensor used this lens is not high. What is the sensor sensitivity?
There is described noise of light, the resulting graph is like jagged. What is the standard approach to reduce the light noise?
Why the sensitivity was evaluated just from 4 wavelengths? What is uncertainty of the instrument?
I don´t understand the reason of evaluation of linear intensity within small range of wavelengths shown in Figure 5.16. What shows intensities of wavelengths of 720 and 740 nm in pages 39 and 40 and why are not numbered and described?

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 thesis aimed in interesting and challenging topic that may show the quality of the student. The presented thesis reached all the thesis guidelines but its performance is poor. I miss systematic approach discussion of decisions and I have doubts about the ability of the student of independent solution of the problem while the thesis description seems to be as the author did something but he had no idea what he do and why. But I want to allow the student to defend his work and convince the committee with his knowledge adequate to the bachelor degree study level in mechanical engineering.

The grade that I award for the thesis is **E - sufficient.**

Date: **10.9.2021** Signature: