BRNO UNIVERSITY OF TECHNOLOGY
FACULTY OF ELECTRICAL ENGINEERING AND COMMUNICATION

Opponent Review of Doctoral Dissertation

Applicant: Ing. Jan Špurek

Title of Dissertation: SIW-based Circularly Polarized Antenna Arrays

Opponent: Prof. Miroslav Joler

Opponent's Department: University of Rijeka, Faculty of Engineering, Rijeka, Croatia

In accordance with the Study and Examination Rules of BUT, in his/her review the opponent will mainly comment on:
a) the topicality of the dissertation,
b) whether the dissertation achieved its given objective,
c) the problem-solving procedure and the results of the dissertation along with the concrete contribution of the doctoral student,
d) the significance for practical application or the progress in the field,
e) formal and language qualities of the dissertation,
f) whether the dissertation fulfils the conditions of Section 47 (4) of the Act,
g) whether the student proved his/her creative abilities in the given research field and whether the work does or does not comply with the standard requirements placed on the dissertations in the given field. The review is not valid without this conclusion.
It is necessary to add a concise commentary to each of the points below.

Ad a) Topicality of the dissertation

The topic of the dissertation is very topical.
Comment:
The dissertation covers a topic of interest for the current state of the art.

Ad b) Objective of the dissertation

The objective of the dissertation was achieved.
Comment:
With some details to clarify during the defense, the declared objectives were achieved.

Ad c) Problem-solving procedure and the results of the dissertation and the concrete contribution of the doctoral student

The problem-solving procedure and the results of the dissertation are average.
Comment:
The Applicant has demonstrated a good creativity in the design, improvement, and manufacturing of the presented circuits, although it is not always entirely clear which of the respective designs are his contribution and what has been proposed in earlier publications. His particular contribution is within computational parametric analyses that indicated sensitivity of the results to specific design parameters.

Ad d) Significance for practical application or progress in the field

The significance for practical application or progress in the field is average.
Comment:
This dissertation contributed computational and measured results that addressed the questions of interest for the targeted audience and indicated areas of caution when it comes to design and manufacturing of this kind of a circuit. The contribution would have been more significant had the optimal values of the design parameters, like the ones in Table III, for example, been expressed in terms of the guided wavelength, rather than as the absolute values because the latter makes it more like a special case, while the former would eventually give it more generality.

Ad e) Formal and language qualities of the dissertation

Formal and language qualities of the dissertation are above average.
Comment:
The text is well organized and structured per chapters and sections. The Introduction and State of the Art chapters brings clear introduction to the topic. The text is written in clear English with only rare and minor errors in figure numbering or incomplete annotation of the graphics (e.g. missing an auxiliary coordinate system) or ambiguities between the information in one part of the text with respect to the information within another part of the text.

Ad f) The dissertation fulfils the conditions of Section 47 (4) of the Act

The dissertation fulfils the conditions of Section 47 (4)*) Act No. 111/1998 Sb. Higher Education Act: YES

((4) Studies are duly finished with a doctoral state exam and dissertation defence, which prove the ability and readiness to work independently in the field of research or development, or in theoretical and*

creative arts. The dissertation must comprise original and published results or results accepted for publication.

Ad g) Creative abilities of the student in the given research field. Compliance with the standard requirements placed on the dissertations in the given field.

The doctoral student did prove his/her creative abilities in the given research field and the work does comply with the standard requirements placed on the dissertations in the given field.
Comment:
Even though it is a bit unusual to have a complete dissertation in this scientific field written without a single equation within it and without sufficient descriptions of the key electromagnetic mechanisms that enable the operation of the circuit in use (counting on the usage of the cited references and modern noncanonical approaches to the circuit design which are heavily based on the usage of EM CAD), the Applicant still showed a sufficient degree of creativity and critical thinking in tackling the objectives of this title and has written a dissertation with a satisfactory scope of analyses and description.

Overall evaluation: The presented material has justified the specified objectives of this dissertation. The text was written in a clear language with a satisfactory degree of included analyses and discussions. The contribution mostly pertains to scaling of the initial design to a higher frequency of interest, discussing the manufacturing challenges related to it. It also contributes with parametric sweep analyses that tackle a sensitivity analysis of the specific design parameters. As such, the dissertation has achieved a sufficient degree of completeness. It would be even more valuable had the optimal design parameters values been expressed in terms of the guided wavelength, rather than as the absolute values.

Opponent's questions:
1. Using Figs. 4.1, 4.2, and 4.3, explain the operation of the structure from the electromagnetic point of view.
2. Why is the result for "run 5" in Fig. 5.11 not equal to the result in Fig. 5.6 because "run 5" supposedly have the unchanged parameters to the ones used to furnish Fig. 5.6?
3. Related to the radiation pattern in Fig. 4.8 and the plotted pattern in XY-plane, what is the orientation of the presumed coordinate system in Fig. 4.5? Analogously for Fig. 5.8 vs. Fig. 5.1 and Fig. 5.5?
-- additional question(s) to be asked in the live session

I ☒ recommend ☐ do not recommend the dissertation for the defence.

Date: 06.10.2021

Signature: ……  ……..