

## I. IDENTIFICATION DATA

<b>Thesis title:</b>	<b>Harmonic Transponder with RF Identification Capability</b>
<b>Author's name:</b>	<b>Giorgi Aptsiauri</b>
<b>Type of thesis :</b>	master
<b>Faculty/Institute:</b>	Faculty of Electrical Engineering (FEE)
<b>Department:</b>	Department of Microelectronics
<b>Thesis reviewer:</b>	Doc. Ing. Milan Polívka, Ph.D.
<b>Reviewer's department:</b>	Dept. of Electromagnetic Field

## II. EVALUATION OF INDIVIDUAL CRITERIA

<b>Assignment</b>	<b>extraordinarily challenging</b>
<i>How demanding was the assigned project?</i>	
<p>The topic of combining harmonic transponder operation and its passive RF identification is, to the best of my knowledge, a new one in the field. From this point of view, the design of a three-band patch antenna radiator, which must be impedance matched at three frequencies to different complex impedances conjugated to the impedance of the loaded diode, is very challenging. In my opinion, the assignment of the thesis overlaps standard engineering work and can be partially considered as research work. However, the student is very knowledgeable and skilled and the thesis assignment was chosen after careful consultation with him.</p>	

<b>Fulfilment of assignment</b>	<b>fulfilled</b>
<i>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.</i>	
<p>The solution meets the requirement of the assignment. The primary objectives, impedance matching of the radiator and diode at three operating frequencies and evaluation of the transponder performance parameters, conversion loss and received power level under predefined conditions, were achieved by measurements on a fabricated sample.</p> <p>The thesis statement of work formulates the potential goal of designing a four-band antenna allowing a larger number of bits for the identification code as a maximalist version of the assignment, but solving such a problem would require more work than the one semester that student has set aside for the thesis.</p>	

<b>Activity and independence when creating final thesis</b>	<b>A - excellent.</b>
<i>Assess whether the student had a positive approach, whether the time limits were met, whether the conception was regularly consulted and whether the student was well prepared for the consultations. Assess the student's ability to work independently.</i>	
<p>The student was very active and very interested in all related technical topics, software tools and measurement methods needed to solve the problem. He learned to use the EM simulator completely independently. He was always well prepared for the consultations and came with his own contributions to the problem. He presented me with an elaborated draft of the thesis well in advance of the submission of the thesis, so that many comments could be incorporated.</p> <p>It was truly an honor to work with such a student.</p>	

<b>Technical level</b>	<b>A - excellent.</b>
<i>Is the thesis technically sound? How well did the student employ expertise in his/her field of study? Does the student explain clearly what he/she has done?</i>	
<p>The thesis is technically sound. The student used knowledge from many related fields such as microelectronics, antenna and microwave technology, related CAD in rf/microwave field and electromagnetic wave propagation.</p>	

<b>Formal level and language level, scope of thesis</b>	<b>A - excellent.</b>
<i>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?</i>	

I find the thesis well structured, the individual issues are well explained, the textual stylization is at a very good level. The English is excellent. Perhaps the only small criticism is that the references are not listed in a separate chapter, but put in an appendix.

**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 thesis provides adequate references to earlier works on the subject. The student's original work is clearly distinguished from earlier works. Citations conform to bibliographic standards.

**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 overall quality of the work is high. The novelty lies in the successful attempt to integrate passive RF identification into harmonic transponder operation. The strength of the work lies in the compact presentation of the problem and one of the possible solutions, namely the integration of the harmonic transponder with the chipless RFID functionality. A potential weakness, if it can be considered a weakness at all, is the level of detail, which of course could be more extensive in terms of theoretical passages and depth of explanation if time allowed.

### 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.*

In any case, I am very satisfied with the work done and the knowledge and skills demonstrated by the student in the solution.

The grade that I award for the thesis is **A - excellent**.

Date: **22.6.2023**

Signature:

