

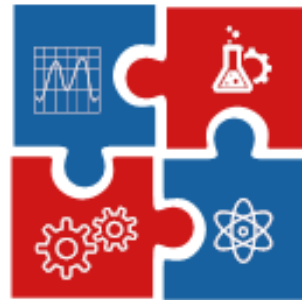
**Innovation Center of  
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**CNN TECH**

# **„International Conference of Experimental and Numerical Investigations and New Technologies“**

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# **Programme and The Book of Abstracts**

**29 June – 02 July 2021**

**Zlatibor, Serbia**

**„International Conference of Experimental and Numerical  
Investigations and New Technologies“**

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|                         |  |
|-------------------------|--|
| <b>Title:</b>           | International Conference of Experimental and Numerical Investigations and New Technologies – <b>CNN TECH 2021</b><br><br><b>PROGRAMME AND THE BOOK OF ABSTRACTS</b>  |
| <b>Publisher:</b>       | Innovation Center of Faculty of Mechanical Engineering<br>Kraljice Marije 16, 11120 Belgrade 35<br>tel: (+381 11) 3302-346, fax 3370364<br>e-mail: <a href="mailto:cnntechno@gmail.com">cnntechno@gmail.com</a><br>web site: <a href="http://cnntechno.com">http://cnntechno.com</a> , <a href="http://www.inovacionicentar.rs">http://www.inovacionicentar.rs</a> |
| <b>Editors:</b>         | Dr Goran Mladenovic, Associate Professor<br>Dr Martina Balac, Senior Scientific Researcher<br>Dr Aleksandra Dragicevic, Scientific Researcher  |
| <b>Technical editor</b> | Dr Goran Mladenovic, Associate Professor   |
| <b>Cover page:</b>      | Dr Goran Mladenovic, Associate Professor   |
| <b>Printed in:</b>      | Innovation Center of Faculty of Mechanical Engineering<br>Kraljice Marije 16<br>11120 Belgrade 35<br>tel: (+381 11) 3302-346   |
| <b>Circulation:</b>     | 100 copies. The end of printing: June 2021.  |

**ISBN: 978-86-6060-077-8**

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# MEASUREMENT OF DIELECTRIC PERMITTIVITY USING COAXIAL CHAMBERS AND ELECTROMAGNETIC- MODELING SOFTWARE

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## Abstract

*Our research group has developed a method for measurement of complex relative permittivity of various dielectric materials in the frequency range from around 1 kHz up to several GHz. Material samples have preferably a disk shape. The thicknesses of the samples can be in a wide range, from about 10  $\mu\text{m}$  (thick films) up to several mm. We have designed and manufactured a set of coaxial chambers, which we use as test fixtures. We have also developed two numerical-simulation programs for the electromagnetic analysis of bodies with rotational symmetry. One program is suitable for the low-frequency analysis. It is based on an electrostatic approach. The other program is based on an electrodynamic approach and it is tailored for microwave frequencies. In measurements, we use impedance meters and network analyzers to obtain the input impedance of a chamber with a sample. Thereafter, we implement our software for the electromagnetic modeling to extract the relative permittivity of the measured sample. As examples of verification of our method, we present here results for the relative permittivities of two sets of samples whose sizes are on the extreme limits of the method. The first set comprises poly (vinylidene fluoride) and mechanically activated ZnO nanoparticle composite films, whose relative permittivities are around 1.8. The second set comprises large, high-density samples of spinel (aluminum magnesium oxide) ceramics, sintered under various conditions. The measured relative permittivities of these samples are around 7.5. In all cases, good agreement with other available data has been obtained.*

## Keywords

Permittivity, Measurements, Electromagnetic-modeling software, Ceramic materials, PVDF

## Acknowledgement

This paper was supported by the Project F133 of the Serbian Academy of Sciences and Arts and by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

**CIP - Каталогизација у публикацији**

Народна библиотека Србије, Београд

621(048)(0.034.2)

62:519.6(048)(0.034.2)

**INTERNATIONAL Conference of Experimental and Numerical Investigations and New Technologies (2021 ; Zlatibor)**

Programme [Elektronski izvor] ; and The Book of Abstracts / International Conference of Experimental and Numerical Investigations and New Technologies - CNN TECH 2021, 29 June - 02 July 2021, Zlatibor, Serbia ; organized by Innovation Center of Faculty of Mechanical Engineering [and] Faculty of Mechanical Engineering, University of Belgrade, Center for Business Trainings ; [editors Goran Mladenovic, Martina Balac, Aleksandra Dragicevic]. - Belgrade : Innovation Center of Faculty of Mechanical Engineering, 2021 (Belgrade : Innovation Center of Faculty of Mechanical Engineering). - 1 elektronski optički disk (CD-ROM) ; 12 cm

Sistemski zahtevi: Nisu navedeni. - Nasl. sa naslovne strane dokumenta. - Tiraž 100

ISBN 978-86-6060-077-8

1. Mašinski fakultet. Inovacioni centar (Beograd)

a) Машинство - Апстракти b) Техника - Нумерички методи - Апстракти

COBISS.SR-ID 41811977