

**МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
СУМСЬКИЙ ДЕРЖАВНИЙ УНІВЕРСИТЕТ
ФАКУЛЬТЕТ ІНОЗЕМНОЇ ФІЛОЛОГІЇ
ТА СОЦІАЛЬНИХ КОМУНІКАЦІЙ**



СОЦІАЛЬНО-ГУМАНІТАРНІ АСПЕКТИ РОЗВИТКУ СУЧАСНОГО СУСПІЛЬСТВА

**МАТЕРІАЛИ ВСЕУКРАЇНСЬКОЇ НАУКОВОЇ КОНФЕРЕНЦІЇ ВИКЛАДАЧІВ,
АСПІРАНТІВ, СПІВРОБІТНИКІВ ТА СТУДЕНТІВ**

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simultaneous condensation or layered condensation of components with further thermoannealing at $700 \div 900$ K.

The study of the magnetic characteristics of the film samples in the form of spin-valve Co/Cu/Co/S fixed magnetic layer thickness of 20 nm Co (bottom) found out that the value of such systems MR at room temperature is between 0,1-0 2%.

A multilayer film system in the form of spin-valve Co/Cu/Co/S is advisable to modify using a multilayer as an upper magnetic layer on the basis of Co and Cu. This modification increases the value of the MR to values of 0.4%, slightly improves performance and improves temperature stability of the system.

A combination of both systems into a complex multi-layer film structures of spin-valve type, in which the top layer is replaced by a magneto-soft multilayer allows you to create a multifunction sensing element of the magnetic field sensor. Performance $R(B)$ of the sensing element will have two maximums at $B = 0$ T and B_k (coercive lower layer) that can ensure the stable operation of the logical element in the three logical states.

METAMATERIALS AND THEIR APPLICATION IN MICROWAVE TECHNOLOGY

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Metamaterial is a composite material whose properties are not so much caused by the properties of its constituent elements as artificial periodic structure of macroscopic elements having arbitrary size and shape.

Artificial periodic structure within the metamaterial modifies its dielectric and magnetic permeability, which allows to control the laws of dispersion, reflection and refraction electromagnetic waves in metamaterials.

Theoretical and experimental research and technical metamaterials applications cover a wide range of frequencies from radio waves to visible light range. The developer has the choice of metamaterials various free parameters (size of the structure, form, constant and variable period of array elements that make up the structure). One possible properties of metamaterials is a negative factor refractive index, which is shown with simultaneous negative dielectric permittivity and magnetic permeability of the material [1].

Components of electromagnetic circuits, having metamaterial properties, find application in antennas engineering in sufficiently high frequency range: 0.1-100 GHz. The main fields of application metamaterials in antennas engineering are [2]:

- emitters arranged above a high-impedance surface,
- a radiating antennas surface wave,
- reduction of the mutual influence of the antenna elements lattices, including MIMO-devices,
- an increase intensification coefficient of the horn antenna.

1. Negative-refraction metamaterials: Fundamental Principles and Applications / Ed. by G.V. Eleftheriades, K.G. Balmain. IEEE Press, A John Wiley & Sons, Inc., 2005. 418 p.

2. Metamaterials Handbook: Vol. I. Phenomena and Theory of Metamaterials. 926 p. Vol. II. Applications of Metamaterials. 724 p. / Ed. by F. Capolino CRC Press, Taylor & Francis Group, 2009.

SOLIDWORKS

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Nowadays, parametric 3D computer-aided design (CAD) of solid and surface models are the principal means for design ideas communicating and developing new products and systems. 3D parametric modeling facilitates visual thinking and design process. There are many programs for creating 3D models.

SolidWorks is upper level CAD, covering the whole range of work tools required for three-dimensional parametric planning and design.

There are several variants for delivering this software: SolidWorks Premium, SolidWorks Professional, SolidWorks Standard, SolidWorks Education Edition.

SolidWorks Education Edition is the simplest configuration with a minimum of modules. It has the most necessary tools for training in educational institutions.

The following program is SolidWorks Standard. It has more advantages than tools of the previous version.