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

(Суми, 21-22 квітня 2016 року)

Суми
Сумський державний університет
2016

bandwidth associated with these TE_{11} mode circular waveguides is narrower than a typical rectangular waveguide in the same general frequency range. However, standard microwave sources have rectangular waveguide output.

A multiband transition from a rectangular waveguide (W, D, G bands) to a circular waveguide (Q band) for the DNP applications is presented. The transition is compact, and provides high return loss (~40 dB) and low insertion loss (S_{21}) ~0.2 dB at high frequency can potentially solve the challenges of transition design such as an efficiency of energy transmission from microwave source to the sample for multiband DNP systems. The dimensions of the transitions were optimized in a full-wave simulator. Properties of the window for DNP applications such as dimensions, mounting place and dielectric losses at different frequencies are presented. To verify the design and simulation results the prototype of scaled transition is realized and tested experimentally in K band.

[1] F. D. Doty, "Probe Design and Construction," 2007.
[2] N. Marcuvitz, Waveguide Handbook. IET, 1951.
[3] W. A. Huting, "Rectangular-to-Circular Waveguide Transitions for High-Power Circular Overmoded Waveguides," Sep. 1989.

SPATAL-DISPERSION CHARACTERISTICS OF TWO-DIMENSIONAL PHOTONIC CRYSTALS

V.S. Shubnikov, *ASP -53fm*
(Sumy State University),
A.M. Diadechko, *ELA*
(Sumy State University)

In recent years the list of application fields of devices based on photonic crystal technology is increasing. They are getting especially popular in such fields as basic electronics, optical fiber information transfer, laser technology. That makes theoretical and experimental studies of such systems relevant.

In this paper the method of decomposition into plane waves dispersion and spatial characteristics of two-dimensional crystals of the type of air-dielectric triangular configuration that can be used as waveguide and resonance systems in the wavelength range from millimeter to optical were analyzed by means of numerical simulation of the task on eigenvalue for stationary Helmholtz equation. The theoretical model includes two artificial crystals with the rod and hole structure in which the stacking factor is normalized to the period varied in the range from 0.1 to 0.5.

The result of numerical studies which was implemented with the help of software Simple Photonic Crystals was the building up of the Brillouin diagrams that could define forbidden and permitted bands and two-dimensional distribution of electromagnetic energy density. The results gained during the research give reasons to state that a stacking factor increase of dielectric material while using the rod structure leads to significant field concentration at the latest rods and reducing of the forbidden zone width. This fact shows that forbidden and permitted zone width can be controlled by changing geometrical parameters, which in its turn, has a positive effect on the frequency bandwidth of material transmission.

The calculations done during the experiments have proved that replacement of the rod structures on the hole, does not lead to significant changes in the band structure, but electromagnetic field density increases in the hole area that may result in bigger energy loses. But it is evident that the hole structure is more simpler to design and implement.

BRAIN – COMPUTER INTERFACE

Shliahetskiy A. A., *IN-41*
(Sumy State University),
Bashlak I.A. *ELAdviser*
(Sumy State University)

Brain -computer interface - the interface that implements the connection between the human brain and the computer. The main idea is that when you think about action and do it, the same part of the brain is activated.In the middle of the XIX century, Emil Du Bois- Reymond showed the relationship between electric current and nerve impulses; in 1875. Richard ketone managed to register the electrical activity of the brain of animals. The psychiatrist Hans Berger in 1924 invented a method to record the electrical activity of the human brain. In 1967, psychiatrist Edmond Dewan published a paper in which he described the experiment where a man was trying to send a message to electroencephalogram by means of dot-and-dash,using brain activity.One of the first practically implemented IMC is considered a virtual keyboard made by Farwell and Donchyn which was created in 1988.

One part of BCI initiation is realization of a computer program that can convert activity of a brain into a computer code. It is difficult because our brain consists of billions of neurons and brain convolutions have an individual location for every person, even for relatives. It means that if one