

Computational physics institute. Complex materials department annual report (2013)

Ivan Petoev

Vasil Tabatadze

Revaz Zaridze

e-mail: ivanpetoev@gmail.com, ivane.petoevi@tsu.ge

Radio physics, Physical processes simulation , Tbilisi State University

There are presented the 2013 annual report of the computational physics institute, complex materials department. In 2013 may Ivan Petoev gained Ph. D. in Physics on the theme “study of the periodical structure electrodynamical properties in order to obtain some complex material’s properties”. The instructors of the Ph. D. thesis were Emeritus Prof. Revaz Zaridze and Assoc. Prof. Vasil Tabatadze. The thesis concerned to the investigation of the periodical metal-dielectric structures’ electrodynamical properties. There is considered as finite, also infinite structures cases. It is known that these structures at certain frequencies have complex materials properties. The main goal of this work was explanation the mechanism of this phenomenon. There was shown that complex properties appearance is related to the multiple resonances, when not only lattice element resonates, also its period and the whole structure parameters are resonant.

In such multiple resonance cases there are obtained negative refraction, chiral properties- which characterizes the complex materials. After Ph. D. thesis defense continues the investigation in this direction. Nowadays there are obtained President’s grant in Rustaveli national science foundation. In the frame of this grant it is planned deeper investigation of the multiple resonance phenomena and also and the widening of the frequency range at which complex effects appears

Besides complex materials, there is considered also other problems. In particular, antenna synthesis problem and also auxiliary sources method application for the case, when the object surface is not closed. The validness of the proposed algorithms and approaches, which was proposed for solution this problem is checked for numerical and real experiments.