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Radio-absorbing parametric material

For parameters that are constant in time, no structure of the absorbing coating (material) can simultaneously satisfy the following four conditions: (a) effective absorption, (b) a spatial ultra-wide absorption band (i.e. the absorption efficiency is independent of the spatial frequency or angle of arrival this wave), (c) a temporary ultra-wide absorption band (i.e. the absorption efficiency does not depend on the time frequency of the incident wave), (d) the small thickness of the absorbing coating compared to the length of the absorbed wave. The microstructure of the parametric coating (material) considered in the presentation allows to simultaneously (jointly) satisfy the conditions (a)-(d) on the basis of the use of elements (optoelectronic switches, optic fibers) of high resolution in space and time. The presentation is considered with a structure (geometrically resembling a foam), consisting of a set of three-dimensional cells, separated from each other by thin walls of controlled transparency. The wall of controlled transparency is a metal grid, where linear elements are electrically connected with each other by optoelectronic switches. Each switch is controlled by pulses of laser through optic fibers. The conducting state of the switches corresponds to opaque state of walls, and the non-conducting state of switches corresponds to the transparent state of the walls. Control of walls transparency presents the alternation in time (during the control period, which is much less than minimum period of the wave to be absorbed) of relatively short time intervals of opacity and relatively long time intervals of transparency. The current distribution of the incident wave field, instantly pierced by the emerging opaque walls, becomes the initial condition for oscillations inside the cell (virtual resonator) and has time to become sufficiently small, since the minimum natural frequency is very great and defined by very small geometric dimensions of each cell.

Figure: One cell of parametric material: optic fibers supplies laser pulses of light to optoelectronic switches

Recent Publications

1. Vladimir V Arabadzhi (2017) Cyclical wave bolt for electromagnetic waves. IJEAS 4(11):137-143.
2. V V Arabadzhi (2005) Nonreflecting Switching Microstructure. Journal of Communications Technology and Electronics 50(5):561-573.

3. V V Arabadzhi (2001) Absorption of Long Waves by nonresonant parametic microstructures. Radiophysics and Quantum Electronics 44(3):249-261.
4. Vladimir V Arabadzhi (2011) Solutions to Problems of Controlling Long Waves with the Help of Micro-Structure Tools, ISBN: 9781608052752, ID: 825415521, e-book Bentham Science Publishers.
5. V V Arabadzhi (2017) Cyclical Wave Bolt for Sound Waves in a Gas Stream // Adv. Sci. Technol. Eng. Syst. J. 2(6):272-274.

Biography

Arabadzhi Vladimir Vsevolodovich is a physicist at Institute of Applied Physics (RAS), Russia. He completed his PhD in 1994 at the field of Radio physics. His achievements are inventions in active wave control. His area of interests is wave thrust, reducing of acoustical and radio visibility of physical bodies.

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