# Application of photonic crystals for microwave generation with high energy accelerator beams

**Kleopova N.A.[1,@], Karpov M.A.[1], Tcherniega N.V.[1], Baldin A.A.[2], Bleko V.V.[2], Bazarov Yu.B.[3], Khristenko A.A.[3] and Kudryavceva A.D.[1]**

[1] Lebedev Physical Institute of the Russian Academy of Sciences, Leninsky Avenue 53, Moscow, 119991, None
[2] Joint Institute for Nuclear Research, Zholio-Kyuri 6, Dubna, 141980, None
[3] Federal State Unitary Enterprise "Russian Federal Nuclear Center—All-Russian Research Institute of Experimental Physics, Mira Avenue 37, Sarov, 607188,

[@] maksim.karpov@gmail.com

In this work, the generation of electromagnetic radiation of a wide spectrum, including microwave and sub-terahertz ranges using three-dimensional ordered nanostructures such as photonic crystals were measured. Generation occurred when the exciting electron beam, created by linear accelerator LINAC-200, passed along the planes of orientation of the globules of the photonic crystal. By varying the orientation of the photonic crystal relative to the electron beam and the beam energy, a tunable narrowband microwave and terahertz source was created. Our experiments involved a set of photonic crystals with different globule diameters and elemental compositions and also included comparative studies using samples of dielectric and semiconductor monocrystals and powders with monodisperse globule sizes. We found that that electromagnetic radiation from single crystals has a similar frequency structure to that of a photonic crystal in the form of a set of narrow-band peaks with a width at half maximum of several MHz appearing in the case, when the beam is passing along the crystallographic orientation axis of the single crystal.