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# Wave Functions of the Positrons Channeling along [111] Direction of the Silicon Crystal

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The positively charged particles can perform the axial channeling in the small potential well formed between three neighboring [111] strings of the Silicon crystal. The transverse motion of the particle in the well is quantized in the quantum mechanical limit. The structure of the wave functions of the stationary states is of interest for the searching the quantum chaos manifestations in the individual quantum states [1] in addition to the ones in the statistics of the energy level sets [2]. Earlier it was made for the channeling electrons in [110] and [100] directions [3, 4]. In both cases the numerical simulation was performed on the square discrete spatial grid since the respective potential wells possess the symmetry $C_{2v}$ and $C_{4v}$ (the symmetry of the rectangular and the square), respectively. However, the potential well between the three [111] strings has the symmetry $C_{3v}$ (the symmetry of the equilateral triangle), so the use of the square grid leads to some artifacts of the numerical simulation.

Here we have developed the algorithm free of artifacts based on the hexagonal spatial grid. We found numerically the complete set of the transverse motion eigenfunctions for the 10 GeV positrons channeling in the [111] direction of the Silicon crystal. The results will be used in the further studies of the quantum chaos.

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**Author:** SYSHCHENKO, Vladislav (Belgorod National Research University)

**Co-authors:** TARNOVSKY, Arthur (Belgorod National Research University); PARAKHIN, Alexander (Belgorod National Research University); Dr ISUPOV, Alexander (Laboratory of High Energy Physics (LHEP), Joint Institute for Nuclear Research (JINR))

**Presenter:** TARNOVSKY, Arthur (Belgorod National Research University)

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