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Title: Predication of 4H-SiC betavoltaics micro battery performance based on a practical Ni-63 source

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We have studied the performance of 4H-SiC betavoltaic micro battery performance under the practical Ni-63 source using combined Monte Carlo method and Medici simulations. A typical p-n junction type betavoltaic device structure with the isotope source placed on top of the p-n junction which includes a p+ layer, a p- layer, an n+ layer and an n- layer was modeled. The self absorption, energy distributions and angle distributions of a realistic Ni-63 source with a 20 % purity were considered. The simulation results show that the device efficiency increases as the source becomes thicker at first and then reaches a saturation level as further increasing the source thickness. In addition, the efficiency of p-n junction battery does not depend on the p-n junction thickness but the doping concentration and thickness of the p- layer. We propose that a sandwich structure with higher doping concentration and larger thickness of the p- layer under a proper thickness of Ni-63 source could lead to an optimal battery efficiency.