The work covers simulation of thermodynamical properties, such as average energy and heat capacity, of relativistic Newton-Wigner pseudoparticle [1], which is placed in external potential field. Spinless Newton-Wigner pseudoparticle corresponds to solutions of relativistic wave equation (Klein-Gordon equation) with positive energies [2]:

\[
\left( i\hbar \frac{\partial}{\partial t} - eA^0(x) \right)^2 - c^2 \left( -ih\nabla - \frac{e}{c}A(x) \right)^2 - m^2c^4 \phi(x, t) = 0.
\]

where \( A_0 \) is scalar, and \((A_x, A_y, A_z)\) - vector potential of external field. In this work we have made generalization of Wiener path integrals for thermodynamics [3] on relativistic Newton-Wigner pseudoparticles. Also, we have developed quantum Monte-Carlo procedure for calculations of thermodynamical averages. For demonstration of the procedure, we have calculated average energy and heat capacity of spinless Newton-Wigner pseudoparticle in 1D - harmonic potential. Such system, which can be named as relativistic harmonic oscillator, is defined by Hamiltonian:

\[
\hat{H} = \omega(\hat{p}) + \frac{m\omega^2}{2}\hat{x}^2
\]

where \( m \) is mass of particle, \( \omega \) is oscillator parameter.