Specific heat for boson matter in multifilament cables[1] GRECIA
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UNAM — We report the isocoric specific heat for an ideal Bose gas confined in a
periodic array of filaments with finite rectangular cross section and infinite length,
set together to form a cable. The filament structure is created by applying to the
gas two, mutually perpendicular, Kronig-Penney delta-potentials, while the bosons
are free to move along the third direction. The energy spectrum accessible to the
particles is obtained and introduced into the grand potential to calculate the specific
heat of the system as a function of temperature for different values of the periodic
structure parameters such as: the number, the area of the cross section and wall
permeability, of the filaments. The specific heat shows a dimensional crossover from
3D to 1D, in temperature regions where the de Broglie wavelength of the bosons is
comparable to twice the separation between the walls of the filaments. Furthermore,
we provide and discuss a criterion for identifying the critical temperature based
on the behavior of the chemical potential and its first derivatives, as well as the
population of the ground state.

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