

Generalizing Field Emission Theory for Surfaces with Strong Electron-Electron Interactions

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Abstract

In the first part of the work, we generalized the canonical Fowler-Nordheim theory (gFN) as we compute the zero temperature transmission probability for a more general case of a barrier described by a fractional power law. We derived an exact analytical formula using Gauss hypergeometric functions and analyzed the dependence of the transmission probability on the power law's exponent.

In the following part, we derived a theoretical framework to investigate the emission properties of 1D correlated metals and its application in nanotube systems. The theoretical framework comprises the description of a 1D correlated metal as the Tomonaga-Luttinger liquid (TLL) model. Here we obtained expression for the TLL local density of states (LDOS). To apply the gFN, the TLL parameters are incorporated into the gFN theory as the power-law's exponents. The two obtained quantities, transmission and LDOS, are then combined to determine the tunneling current as a function of temperature for an array of nanotubes. The methodology was further developed to analyze the tunnelling spectra of two types of nanotubes: those gapless and those with mini-gaps.

Biography



Naira Grigoryan is a young physicist with academic roots in “Applied Mathematics and Physics” from Yerevan State University. After completing her Bachelor's degree, she specialized in optics at the same institution, subsequently advancing her knowledge at the University of Burgundy with a Master's in “Physics, Photonics, and Nanotechnology”. Her educational journey has led her to the Institute of Fundamental Technological Research PAS in Warsaw, where, as a Ph.D. student, she delves into the nuances of electron field emission from nanotube materials, exploring critical intersections of physics and advanced technology.

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