



Contribution ID: 76

Type: not specified

## Vacuum currents near horizon of a cylindrical black hole

Thursday, September 30, 2021 12:40 PM (25 minutes)

Vacuum currents near horizon of a cylindrical black hole V. Kh. Kotanjyan, A. A. Saharian, M. R. Setare  
We investigate the vacuum expectation value (VEV) of the current density for a charged massive scalar field with general curvature coupling parameter near a cylindrical black hole in background of (D+1)-dimensional spacetime. It is shown that, to the leading order, the near-horizon geometry is reduced to locally Rindler spacetime with toroidally compact subspace. For the latter geometry and assuming that the field is prepared in the Fulling-Rindler vacuum state, the Hadamard function is evaluated for the general case of compact and uncompactified spatial dimensions. Quasi-periodic conditions with general phases are imposed along compact dimensions. By using the expression for the Hadamard function, the VEV of the current density is studied. It shows that it has non-zero components only along compact dimensions. They are periodic functions of the magnetic flux enclosed by compact dimensions with the period equal to the flux quantum.

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