Accepted Manuscript

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PII: S0378-4371(14)00758-4
DOI: http://dx.doi.org/10.1016/j.physa.2014.08.073
Reference: PHYSA 15533

To appear in: *Physica A*

Received date: 21 May 2014
Revised date: 9 August 2014

Please cite this article as: A. Algin, A.S. Arikan, E. Dil, High temperature thermostatistics of fermionic Fibonacci oscillators with intermediate statistics, *Physica A* (2014), http://dx.doi.org/10.1016/j.physa.2014.08.073

High temperature thermostatistics of fermionic Fibonacci oscillators with intermediate statistics

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Abstract

In this study, we pursue an original idea about whether unique deformed particle algebra could effectively describe a set of crucial quantum properties including the non-standard statistics of particles, the internal structure of particles, and the interaction of particles. Following such an idea, we consider a specific Fermi gas model containing the two-parameter deformed fermionic particles called fermionic Fibonacci oscillators. For such a system, several thermostatistical functions such as the total number of particles, the internal energy, and the entropy are calculated in the thermodynamical limit by means of some properties of the Fibonacci calculus. A virial expansion of the equation of state for the system is also obtained, and the first five virial coefficients are derived in terms of the real independent deformation parameters q and p. From the results obtained here, it is first found that for two and three spatial dimensions, the present deformed Fermi gas model shows an interpolation between fermionic and boson-like systems, and secondly, it is concluded that the two-parameter deformation of fermions leads to a suitable framework for an effective description of interacting composite particle systems.

PACS numbers: 02.20.Uw; 05.30.-d
Keywords: Composite fermions, deformed Fermi gas model,
virial expansion, thermostatistics.

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