Research on Relativistic Theory of Infinite Statistics Fields

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Abstract. Recently, infinite statistics has been applied to many subjects, such as black hole statistics, dark energy quanta, and large matrix theory and holo graphy principle. In this paper, we introduce the general propertyof infinite statistics and it current research situation. We also prove the exist enceofinte raction relativistic field theory obeying infinite statistics bysolving the difficulties to provide references to relevant researchers.

Introduction

We usually set the extreme black hole as the research object in the black hole in statistics in order to analyze thequantum system composed of a group of black hole. The semi classical calculations show that a chargeblack hole mass will be in hocking under the action of radiation decreases, unless the quality with the load ratio reached a critical value. And it is this extreme black hole quality reaches the critical value of the black hole, the black hole is so extreme in a given load case the smallest stationary black hole when considering quantum effects. At the same time no hair theorem tells us that the nature of black holes by mass, angular momentum and charge only, which is very similar to the micro black hole of identical particles. These two properties make the extreme black hole is often used to study on black holes in quantum mechanics. Especially with large loadextreme black hole, the quantum gravity effects can be neglected under the circumstances can be used to simulate the scattering of low-energy particles. The study of black hole statistics is based on such a background.

We consider the 2N charged extreme black hole, in which N is positive, the other N negative.Each with positive and negative charges of the black hole by a wormhole is connected. The power line charge from a black hole in the wormhole connected to another black hole, both ends like a pipe is connected with two black holes. At this time, we observed only in the side of the wormhole N black hole. We exchanged two black holes are not connected, as if the two particles exchange in field theory. In the traditional theory, through the exchange of this two times, the system remains the same, therefore, only 1 of people exchange factor may be a means of exchange, which is the +1 symmetry, -1 bosons, in exchange for anti-symmetric, namely fermions. However, the black hole model, because of the connection of two black holes is a wormhole, which is a kind of spatial topological structure, each exchange will form a new geometric topology, and the system will not keep unchanged. On the other hand, when we describe the black hole system with the wave function, the topological line behind them does not appear, it is like a black hole of the internal degrees of freedom, the statistics is similar to the resolution of particle system. As we know, this is nothing, it is infinite statistics. Similarly, although not a wormhole connection, magnetic flux distribution due to the extreme black hole horizon in different, also has an infinite number of internal degrees of freedom, follow the same infinite statistics.Soon after the proposed black hole statistics, the calculation method of Stroloillgel and Vafa extreme black hole through the D membrane approximate entropy, and get the same results with the Hocking radiation, which means that D can be used to describe the black hole film. In fact, approximation in D film, used to describe a quantum black hole contains a set of infinite D film. While Witten has proved effective action of N parallel coexistence D_p film can be composed of 10 dimensional U (N) Yang Yi Mills (Yang-Mills) super symmetric field theory is reduced to the p+1 dimension. This will be transferred to the problem of quantum chromo dynamics (QCD) in the N group. This method can also be used to describe the black hole.

Self-consistency of Relativistic Theory of Infinite Statistics Fields

We can prove infinite statistics theory scattering matrix can indeed satisfy Lorentz invariancein spite of a non-local theory, which makes us relativistic quantum field theory may establish infinite statistics. However, there is still a problem of conservation of statistics, when infinite statistics and Bose Fermi field coexist, and how to avoid infinite statistics like two particle scattering two boson field such statistical conservation process.

The energy additively refers to the two spacelike infinity subsystems, and the total energy of the system of contribution should be additive. For all field,

$$(e^{iHAt}\psi A)\otimes(e^{iHBt}\psi B)=e^{i(HA+HB)t}(\psi A\otimes\psi B) \quad (1)$$

It is easy to see that this condition is in fact equivalent to the interaction at the A of B and is separated in space like infinity particle field effect,

$$[\mathrm{H}(x),\psi(x')]\to 0 \quad \text{as} \quad x-x'\to\infty spacelike \quad (2)$$

The emphasis on "infinity" means it is not on the local requirements, but the requirements of physical reality, it is impossible to completely and the whole system related requirements a system from the perspective of physical intuition, this distance is difficult to accept. On the other hand, the decomposition and cluster requirements is very similar to a certain extent, the problem will be discussed in the next section. In the traditional quantum field theory, because of the stronger local conditions exist, this is not difficult to meet the requirements, only need to interact in all the number of fermions can be. Similarly, in the class of Bose Fermi statistics requires the existence of an even number of particle. These requirements, have led to the statistical properties of the corresponding conservation. For the energy additively condition is equivalent to the bionic Hamiltonian statistical properties, resulting in $q=\pm 1$. However, after the study we found that the Hamiltonian must Bose this condition is too strong, in fact can be a much weaker restrictions on the interaction Hamiltonian to meet energy additively, and this limitation, can also meet the requirements of conservation of statistics.In order to make energy additively of q=0 is set up, first of all, we need to be Hamiltonian form into

$$[\mathrm{AH}(x),\psi(x')]\to 0 \quad \text{as} \quad x-x'\to\infty spacelike \quad (3)$$

Due to

$$[\mathrm{A}(O),a_p]=-a_pO \quad (4)$$

$$[\mathrm{A}(O),a_p^+]=-a_p^+O \quad (5)$$

So we can have

$$[\mathrm{AH}(x),\psi^+(x')]=-\psi^+(x')\mathrm{H}(x) \quad (6)$$

$$[\mathrm{AH}(x),\psi^-(x')]=\mathrm{H}(x)\psi^-(x') \quad (7)$$

Because the operator form is widely used in infinite statistics, we only excluded in all fields or for annihilation field, we demand the Greenberg requirements easier,and also need not infinite statistics. Although the interaction Hamiltonian density no longer satisfy Bose statistical theory, we can also meet the conservation "consider infinite statistics field and ordinary statistical field coupling conditions, using the subscript j to mark infinite statistics and field using the subscript B to mark the common statistical field theory" according to the traditional theory and our analysis above, all interactions must contain an even number of fermions (including zero), at least one infinite statistics and a field of infinite statistics and field annihilation arbitrary Bose field "between these different types of field are easy, so

$$\mathrm{A}(O_1,O_B^{'})=\mathrm{A}(O_1)O_B^{'} \quad (8)$$

Because we excluded only containing field and contains only the annihilation, the timing of S-operator product represents $T\left\{A(\mathrm{H}(x_1))\cdots A(\mathrm{H}(x_N))\right\}$. When all of the creation and annihilation operators and shrinkage is completed, there are still ψ_1^+ and ψ_1^-. The rest of the two fields and the initial and final states must produce phase shrinkage and annihilation operator of infinite statistics, so the particle must exist in the initial state and the final state at the same time. This would eliminate the early (late) to comply with the ordinary state particle (infinite) and late (early) statistics follow infinite state particle (general) statistical situation. On the other hand, due to the interaction $A(\psi_1^+ \psi_1^{+c})\psi_B$ and $A(\psi_1^+)(\psi_B^+ \psi_B)$. No, we can also rule out such a virtual process. A pair of infinite (ordinary) statistical particle annihilation from common (infinite) intermediate particle statistics, and then generate infinite statistics particle states (general).Therefore infinite statistics theory can be constructed successfully to avoid conservation problems and solve energy statistical problems.

Cluster Decomposition Theorem

Cluster decomposition theorem is the basic principle in physics, namely the space spaced far enough experiments.The experimental results are not related. For example, the particle collision probability measurement at Fermi lab and in CERN while doing the same experiment is independent of each other. If the cluster decomposition theorem does not hold, we can never predict any results, unless we know of the universe. In the matrix of S- scattering theory, cluster decomposition theorem if there are N particle scattering process

$$\alpha_1 \to \beta_1, \alpha_2 \to \beta_2, \ldots \alpha_N \to \beta_N \quad (9)$$

N occurred in the distant laboratory, S- matrix and the whole process of the matrix can be factorized into

$$S_{\beta_1+\beta_2+\ldots+\beta_N;\alpha_1+\alpha_2+\ldots+\alpha_N} \to S_{\beta_1\alpha_1\beta_2\alpha_2\ldots\beta_N\alpha_N} \quad (10)$$

If for all, these factorization relations can guarantee factor of transition probability, factor of experimental results is not associated with that, this is the statistical relationship between independent events.

In the more general case, we can put the writing (10) into (11).

$$S_{\beta\alpha} = \sum (\pm) S^c_{\beta_1\alpha_1} S^c_{\beta_2\alpha_2} \quad (11)$$

In that formula, $S_{\beta\alpha}$ represents correlation matrix, and $\sum$ means all the clusters method

$$\alpha \to \alpha_1, \alpha_2, \ldots, \alpha_N \quad \text{and} \quad \beta \to \beta_1, \beta_2, \ldots, \beta_N \quad (12)$$

In traditional statistics, the sum of positive and negative, respectively with an even or odd number of fermions in exchange "in infinite statistics, we note that due to the effect of CPT conservation, will also have a positive and negative number corresponding to the interaction Hamiltonian density in spinner field.

Conclusion

As Bose Fermi third statistics, infinite statistics have many good properties, such as non-locality and holographic entropy bound. These properties make infinite statistics theory to describe black hole statistics, widely used "but with the development of this theory, system and holographic dark energy. We found the theory of relativity is difficult to promote. The lack of a local commutability means that the Lorentz invariance, on the other hand, space likes infinity subsystem energy additively and statistical properties and conservation of infinite statistics theory is a contradiction. We show that the interaction of the specific form of the Hamiltonian, the space like infinity system energy is additive, but this form also meet the requirements of conservation of statistics. We further prove that the cluster reparability of this theory, this is the most basic requirements of relativistic field theory. In a word, we can see that infinite statistics as a relativistic quantum field theory of statistics is based on self-consistent and feasible, and the no locality can promote our understanding of quantum gravity and dark energy and new physics. Whether from the basic theory research and the application prospects, it still has a lot of space exploration, which is our main research direction of the next step.

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