Concept of duality of deformed analogs of Bose gas model, and its applications

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Under concept of "duality" of deformed Bose gas models we understand certain correspondence between two, *differently defined*, models sharing same properties. Namely, we studied the pairs from two classes: a) the one defined using φ-deformed derivative in modified thermodynamic relations [1], b) via $\tilde{\varphi}$-deformed oscillators [2] in statistical mechanics approach. The "physics" in the both models, mainly, should agree. That concerns E.O.S., at least one-particle distribution, and is encoded in related deformation structure functions (DSFs) of two models. For latter to match, DSFs φ and $\tilde{\varphi}$ should be related: $\tilde{\varphi}(n) = \sum_{i=1}^{n} \frac{\varphi(i)}{i} + \dots$, $0 \leq n \leq N_{\max}$, $N_{\max}$ – maximal occupation number of $\tilde{\varphi}$-oscillator. Say, between two versions of $\tilde{\mu}, q$-Bose gas, see [1,2], such duality relation provides coincidence of one-particle distributions. The one $n_{\mathbf{k}}^{(\varphi)}$ in φ-deformed model [1], recovered from $N^{(\varphi)} = \sum_{\mathbf{k}} n_{\mathbf{k}}^{(\varphi)}$, and distribution $n_{\mathbf{k}}^{(\tilde{\varphi})} \equiv \langle \tilde{\varphi}(N_{\mathbf{k}}) \rangle$, as in [2], are required to agree.

We applied "duality" relation to interacting π-meson gas, created in heavy-ion collisions, and obtained estimates for effective scattering length, characteristic interaction energy. Proposed corrections to $(\tilde{\mu}, q)$-deformation [1,2] incorporating interaction and composite structure of particles.

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