Alternative Supersymmetries

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Algebraic structure of all supersymmetries known today in models of relativistic and nuclear physics is associated with $\mathbb{Z}_2$-graded Lie superalgebras (or supergroups). In this talk alternative supersymmetries based on $\mathbb{Z}_2 \times \mathbb{Z}_2$-graded Lie superalgebras are discussed. Algebraic structure of parastatistics is also considered and it will be show that one of mixed parastatistics of Greenberg and Messian is related with $\mathbb{Z}_2 \times \mathbb{Z}_2$-graded orthosymplectic Lie superalgebras $\mathfrak{osp}(2m,1|2n)$. It turns out that there exits a more general case of parastatictics which is associated with $\mathbb{Z}_2 \times \mathbb{Z}_2$-graded orthosymplectic Lie superalgebras $\mathfrak{osp}(2m_1, 2m_2 + 1|2n_1, 2n_2)$ and which includes (as degenerate cases) all known parastatistics of Green and Greenberg - Messian. Potential applications of $\mathbb{Z}_2 \times \mathbb{Z}_2$-graded Lie superalgebras in SUSY models of nuclei are briefly discussed.