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Order and supersymmetry at high filling zero-energy states on the triangular lattice DIMITRIOS GALANAKIS, Nanyang Technological University, Singapore, CHRIS HENLEY, Cornell University, STEFANOS PAPANIKOLAOU, Yale University — We perform exact diagonalization studies in $d = 2$ dimensions for the Fendley and Schoutens model of hard-core and nearest-neighbor excluding fermions that displays an exact non-relativistic supersymmetry. Using clusters of all possible shapes up to 46 sites, we systematically study the behavior of the ground state phase diagram as a function of filling. We focus on the highly degenerate zero-energy states found at fillings between 1/7 and $\sim 1/5$. At the lower end of that interval, at filling 1/7, we explicitly show that the ground states are gapped crystals. Consistent with previous suggestions, we find that the extensive entropy of zero states peaks at a filling of ~ 0.178. At the higher end of the interval, we find zero energy ground states at fillings above 1/5, contrary to previous expectations; which display non-trivial amplitude degeneracies.

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