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High-dimensional fractionalization and spinon deconfinement in pyrochlore antiferromagnets ZOHAR NUSSINOV, Washington University, St, Louis, CRISTIAN BATISTA, BRUCE NORMAND, STUART TRUGMAN, Los Alamos National Lab — Spin $S = 1/2$ Klein models on the checkerboard and pyrochlore lattices contain in their ground–state manifold the subspace generated by the set of singlet dimer coverings, and thus possess an extensive ground–state degeneracy. Among the many exotic consequences is the presence of deconfined fractional excitations (spinons) which propagate through the entire system. While a realistic electronic model on the pyrochlore lattice is close to the Klein point, this point is in fact inherently unstable because any perturbation ϵ restores spinon confinement at $T = 0$. We demonstrate that deconfinement is recovered in the finite–temperature region $\epsilon \ll T \ll J$, where the deconfined phase can be characterized as a dilute Coulomb gas of thermally excited spinons. We investigate the zero–temperature phase diagram away from the Klein point by means of a variational approach based on the singlet dimer coverings of the pyrochlore lattices and taking into account their non–orthogonality.

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